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Plan

Risk Management Plan for the Operable Unit 7-10 Stage III Project

Prepared for:
U.S. Department of Energy
Idaho Operations Office
Idaho Falls, Idaho

Idaho National Engineering
and Environmental Laboratory

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Risk Management Plan
for the Operable Unit 7-10 Stage III Project

PLN-1358
Revision 0

Prepared

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OU 7-10 Stage III Project

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ABSTRACT

This project risk management plan defines the scope, responsibilities, and methodology for identifying, evaluating the impacts of, and managing risks associated with the Operable Unit 7-10 Stage III Project. This project will be conducted at the Subsurface Disposal Area within the Radioactive Waste Management Complex at the Idaho National Engineering and Environmental Laboratory.

The objective of risk management as described in this plan is to identify unacceptable project risks (i.e., above-normal risks that could jeopardize the successful completion of the project) for the selective application of appropriate response actions to reduce or mitigate such risks to acceptable levels. This plan applies to risk management during all project phases as well as to internal and external project deliverables. This plan addresses the standard risk types including programmatic (nontechnical), technical, cost, and schedule risks, but does not address certain safety-type risks addressed through other prescribed risk-assessment processes.

The risk management process described in this plan is based on Practice 8, "Risk Management," of the U.S. Department of Energy Project Management Practices; Section N, "Project Risk Management," of Idaho National Engineering and Environmental Laboratory Guide 70; and U.S. Department of Energy Manual 413.3-1, "Project Management for the Acquisition of Capital Assets." As suggested, in Practice 8, specific processes have been tailored to fit the requirements, size, complexity, and interfaces of the project.

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ACRONYMS

CD	critical decision
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
D&D&D	deactivation, decontamination, and decommissioning
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy Idaho Operations Office
GDE	guide
INEEL	Idaho National Engineering and Environmental Laboratory
LMAES	Lockheed Martin Advanced Environmental Systems
MCP	management control procedure
OU	operable unit
RMP	risk management plan
ROD	record of decision
RWMC	Radioactive Waste Management Complex
SDA	Subsurface Disposal Area
SOW	scope of work
T&PRA	technical and programmatic risk analysis
WIPP	Waste Isolation Pilot Plant

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DEFINITIONS

Assessable element: Discrete entities against which an effective risk analysis may be performed and results evaluated.

Consequence of occurrence: A qualitative representation of the potential impact of realizing a risk (i.e., the impact of a risk event). Consequence of occurrence is expressed using a descriptor (label) or a numerical factor (0 to 1).

Probability of occurrence: A qualitative representation of the relative likelihood of realizing a risk expressed using a descriptor (label) or a numerical factor (0 to 1).

Residual risk: Risk remaining after the risk-handling strategy has been implemented.

Risk: Degree of exposure to an event that might happen to the detriment (usually) or advantage of a program, project, or activity. Risk is described by the probability that the event will occur and the consequences of that event. This term is usually reserved for situations or events that are in some way significant or that pose above-normal project risks.

Risk assessment: Investigation (analysis) and quantification of risk.

Risk factor: Numerical representation of a risk. Defined as the multiplication product of the probability of occurrence factor (0 to 1) and the consequence of occurrence factor (0 to 1), and expressed as a unitless number of realizing a given risk.

Risk handling: See risk response.

Risk level: Qualitative representation of a risk as either high, moderate, or low. Risk level can be associated with the risk factor of a risk.

Risk response: Management strategies used to reduce the likelihood or mitigate consequences of a risk, or that transfer, spread, avoid, or accept the risk.

Trouble trigger: A predefined condition or event that signals a change in a moderate or high risk such that it is more likely to occur unless some action is taken. Also, a condition indicating that the previously defined risk-handling strategy or associated actions no longer may be effective in managing the risk.

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1. INTRODUCTION

This risk management plan (RMP) defines the scope, responsibilities, and methodology for identifying, evaluating impacts of, and managing risks (see definition) that could jeopardize successful completion of the Operable Unit (OU) 7-10 Stage III Project. This project is being conducted at the Subsurface Disposal Area (SDA) within the Radioactive Waste Management Complex (RWMC) of the Idaho National Engineering and Environmental Laboratory (INEEL). The OU 7-10 Stage III Project is a third-tier project under the Idaho Completion Project and the RWMC Completion Project, in that order.

Project risk management as described in this plan applies to all project phases (i.e., design, construction, turnover, startup, operations, operations closeout, and final deactivation, decontamination, and decommissioning [D&D&D]) as well as internal and external project deliverables. This plan addresses standard risk types including programmatic (nontechnical), technical, cost, and schedule risks. However, this plan does not address certain safety-type risks addressed through other prescribed risk-assessment processes (e.g., environmental risk assessments performed for Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) [42 USC § 9601 et seq.] response actions; the U.S. Department of Energy [DOE] safety analysis process; fire hazards analyses; and the hazard identification and mitigation process described in "Integrated Work Control Process" [STD-101]). The objective of risk management as described in this plan is to identify above-normal risks for the selective application of appropriate response actions to reduce or mitigate such risks to acceptable levels.

The objective of this plan is to promote project success by eliminating, reducing, and managing assessable risks that could contribute to or result in project failure.

1.1 History of Project Risk Management

This plan has been prepared in accordance with Management Control Procedure (MCP) –9106, "Management of INEEL Projects." The risk assessment process used and documented in this plan is adapted from the following guidance documents:

- Guide (GDE) –70, "Guide for General Project Management Methods"; Section N, "Project Risk Management"
- GDE-104, "Applying Risk Management"
- DOE Order 413.3, "Program and Project Management for the Acquisition of Capital Assets"
- Section 1, Chapter 14, "Risk Management," of DOE Manual 413.3-1, "Project Management for the Acquisition of Capital Assets"
- Practice 8, "Risk Management (Draft)," of the DOE Project Management Practices (DOE 2000).

This plan is initiated to support the Critical Decision (CD) -0 decision process and may be modified as required for subsequent project phases to meet expected maturity values (as described in the *Environmental Management Project Definition Rating Index (EM-PDRI)* [DOE 2001]) and project requirements.

The need for this RMP and the decision to develop it as a standalone document is based on the history, size, and complexity of the project and the multiple sources for risk as identified in results of the initial risk screening (see Appendix A).

1.2 Purpose and Scope Summary

The purpose of this plan is to provide a structured approach for identifying above-normal risks related to design and execution of the project and for controlling these risks to an acceptable level. Above-normal risks are those risks that, by the nature of the project, either (1) pose a higher risk than normally experienced for the risk or event type or (2) make normal project controls (in the absence of additional measures) inadequate to mitigate the risks to acceptable levels.

Primary objectives of this plan include the following:

- Ensuring application of appropriate and cost-effective measures for associated risk abatement, tracking, and monitoring activities
- Describing roles and responsibilities of project personnel in carrying out risk management functions
- Establishing risk assessment criteria and guidelines for risk management documentation
- Describing formats for risk reporting
- Identifying tools to be used (e.g., forms for risk identification and assessment and database systems for tracking risks and associated response actions).

The structured approach defined in this plan includes the following:

- Risk management planning
- Risk identification
- Risk quantification
- Risk handling (i.e., response planning and execution)
- Impact determination
- Risk-item tracking, reporting, and closure.

This approach, with the exception of the risk management planning function, is intended to be executed in a step-wise, iterative manner that is coordinated to the staged DOE Order 413.3 CD process. However, quantification, handling, impact determination, and reporting of specific risk items (i.e., those identified between CD points) may occur on a real-time basis depending on the urgency and nature of the risk item.

1.3 Scope Limitations

Risk management, as defined in this plan, does not apply to the following:

- Environmental, safety, or Occupational Safety and Health Administration risk assessments and performance of these specific safety-type risk assessments—However, these specific safety-type assessments may offer input to the risk management process based on the likelihood of events materializing as risks that would increase project cost, cause schedule delays, reduce safety margins, or reduce the quality of the final product. Management of these risks is required as part of performing work, but are managed using other INEEL procedures.

- Risk from operation of systems covered by a safety analysis—The unreviewed safety question and facility management processes are designed to manage these risks.
- Risk associated with Stages I and II of the OU 7-10 Staged Interim Action Project—Risks associated with Stages I and II are documented in other INEEL plans and reports.

1.4 Applicability

The OU 7-10 Stage III Project management risk team will use and implement this plan. Section 2.4 contains descriptions of the team members and Section 2.5 discusses assignment of risk management responsibilities.

1.5 Project Risk Evolution

The risk management process will evolve throughout project execution and be captured in revisions to this plan (see Table 1 for the planned revision schedule). Revisions are based on accumulated project knowledge and design information developed since the last revision. Plan revisions will allow appropriate tailoring to occur at each project phase. Because of the length of the project and the ever-changing project execution environment, this tailoring will maintain efficient and cost-effective processes for ensuring that the desired level of risk management process maturity is achieved.

Table 1. Timetable and completion dates for the Operable Unit 7-10 Stage III Project.

Activity Preceding Milestone or Approval Event	Planned Revision Number[a]	Critical Decision Approval	Target Completion Date
Preconceptual design	0	CD-0	October 31, 2003
Conceptual design	1	CD-1	October 31, 2004
Title I (preliminary, 30%) design	2	CD-2	October 31, 2005
Title II (draft, 90%) design	—	—	November 30, 2006
Complete Stage III remedial design and commence construction	3	CD-3	March 31, 2007[b]
Construction (including turnover)	—	—	February 28, 2009
Startup (including operational readiness review and prefinal inspection)	—	CD-4	b
Commence Stage III operations	—	—	—

a. Actual revisions may differ.
b. According to the April 2002 *Agreement to Resolve Disputes* (DOE 2002), DOE shall commence Stage III operations by no later than 36 months after commencement of construction.

CD = critical decision
DOE = U.S. Department of Energy

2. OPERABLE UNIT 7-10 STAGE III PROJECT

2.1 Project Background

The INEEL is a DOE facility located 52 km (32 mi) west of Idaho Falls, Idaho, and occupies 2,305 km^2 (890 mi^2) of the northeastern portion of the eastern Idaho Snake River Plain. The RWMC is located in the southwestern portion of the INEEL as shown in Figure 1. The SDA is a 39-ha (97-acre) area located within the RWMC. Waste Area Group 7, the designation for the RWMC as used in the *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory* (DOE-ID 1991), encompasses the SDA buried waste site. The Federal Facility Agreement and Consent Order integrates CERCLA response obligations and Resource Conservation and Recovery Act (RCRA) (42 USC § 6901 et seq.) and Hazardous Waste Management Act (Idaho Code § 39-4401 et seq.) corrective-action obligations at the INEEL that relate to the release(s) of hazardous substances covered by the agreement.

Waste Area Group 7 is subdivided into 13 OUs.[a] Pit 9, designated OU 7-10, is located in the northeast corner of the SDA as shown in Figure 2. The OU 7-10 site is an area into which chemicals, radioactive materials, and sludge from DOE weapons plants and other government programs were disposed. While such disposals at the RWMC began in 1952, OU 7-10 was used and filled from 1967 through 1969. The pit contains characteristic-hazardous, listed-hazardous, low-level radioactive, and transuranic (TRU) waste.

In 1993, the OU 7-10 Interim Action Record of Decision (ROD) (DOE-ID 1993) was signed. The associated *Remedial Design/Remedial Action Scope of Work and Remedial Design Work Plan: Operable Unit 7-10 (Pit 9 Project Interim Action*) (EG&G 1993) documented the schedule and approach for implementation of the OU 7-10 Interim Action ROD, and the DOE management and operating contractor subcontracted with Lockheed Martin Advanced Environmental Systems (LMAES) to perform the OU 7-10 Scope of Work (SOW) (EG&G 1993).

The INEEL revised the OU 7-10 SOW in 1995 (LMITCO 1995) to address details for design, construction, and operation approaches. This resulted in significant changes in the OU 7-10 Interim Action ROD cost estimates, which in turn required the issuance of the *Explanation of Significant Differences for the Pit 9 Interim Action Record of Decision at the Radioactive Waste Management Complex at the Idaho National Engineering Laboratory* (DOE-ID 1995).

The DOE prepared a contingency plan to accommodate the possibility that LMAES might not fulfill the terms of the 1993 OU 7-10 SOW (EG&G 1993). This contingency plan developed into the staged interim action approach formalized in the revised OU 7-10 SOW, *Remedial Design/Remedial Action Scope of Work and Remedial Design Work Plan: Operable Unit 7-10 (Pit 9 Project Interim Action)* (LMITCO 1997), issued in 1997. The revised OU 7-10 SOW (LMITCO 1997) identified performance objectives, milestones, and deliverables in the event that the LMAES contract was not completed. The LMAES contract was subsequently terminated and the INEEL began work on the Staged Interim Action Project.

The 1998 Explanation of Significant Differences to the OU 7-10 Interim Action ROD (DOE-ID 1998), which launched the Staged Interim Action Project, also formalized the adoption of the

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a. Operable Units 13 and 14 were combined into the comprehensive remedial investigation and feasibility study in 1995 (Huntley and Burns 1995).

three-stage (i.e., Stages I, II, and III) approach for satisfying requirements of the OU 7-10 Interim Action ROD, its two associated Explanation of Significant Differences Documents (DOE-ID 1995, 1998), and the Remedial Design/Remedial Action SOW (LMITCO 1997).

The three stages of the Staged Interim Action Project are as follows:

- Stage I—Subsurface exploration of OU 7-10 to support siting of Stage II.
- Stage II—Limited waste retrieval demonstration of a select area of OU 7-10 including excavation and retrieval of waste zone material and overburden soils, as well as characterization, packaging, and storage of retrieved waste zone material. Stage II also includes design, procurement, construction, and subsequent removal of project facilities and equipment from the pit surface as well as underburden sampling and analysis.
- Stage III—Overall remediation of OU 7-10 using information from Stage II.

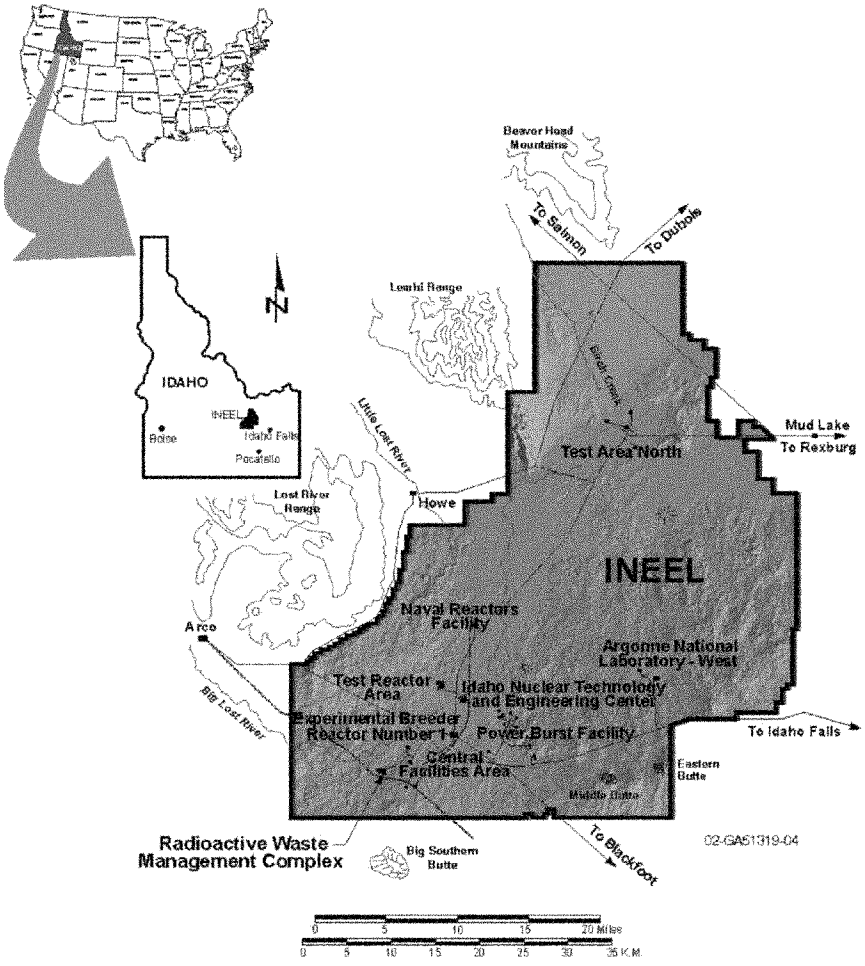

Figure 1. Map of the Idaho National Engineering and Environmental Laboratory showing the location of the Radioactive Waste Management Complex and other major Site facilities.

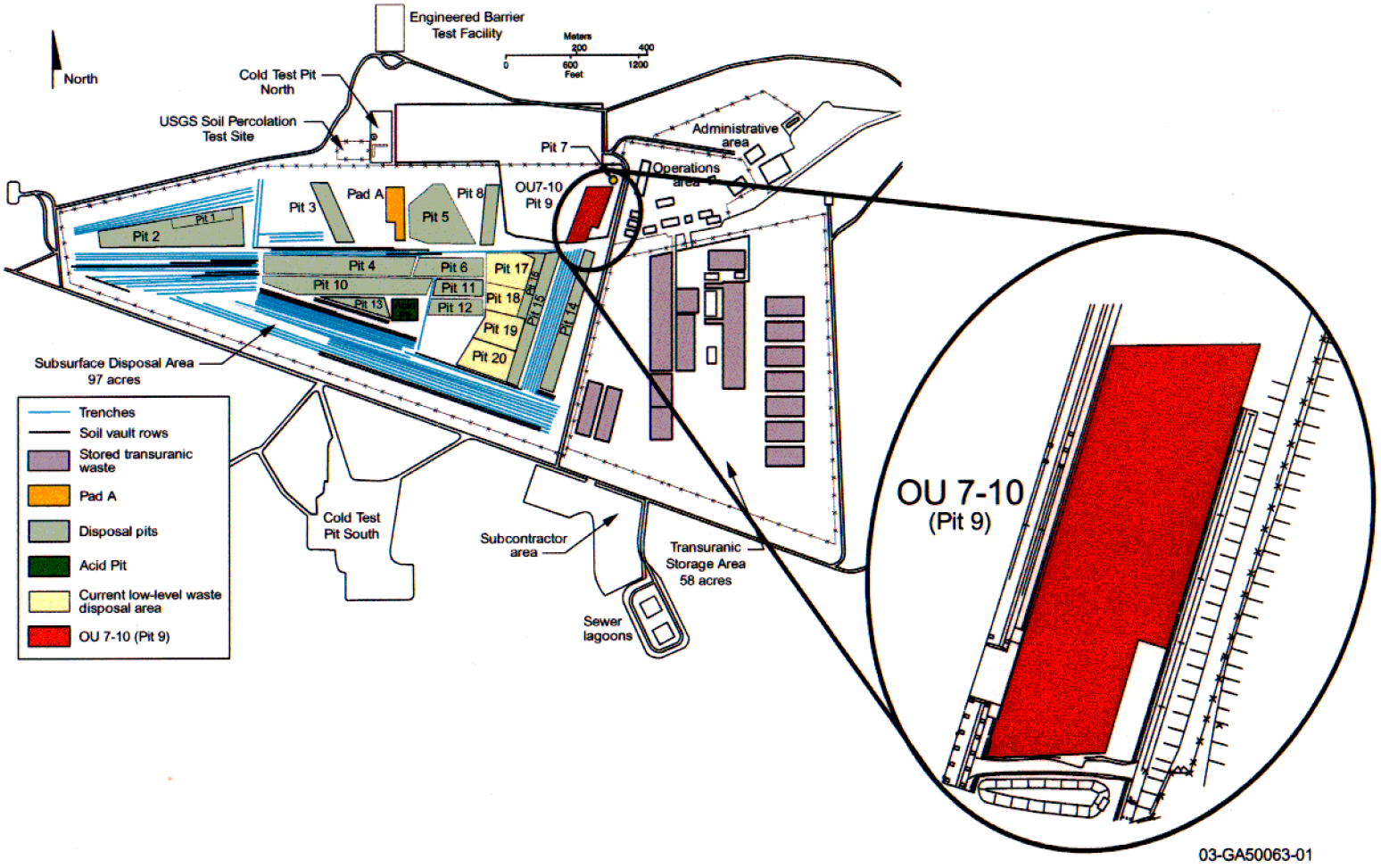

Figure 2. Graphic representation of the Radioactive Waste Management Complex showing an expanded view of the OU 7-10 Stage III Project area.

The mission of the OU 7-10 Stage III Project is to (1) implement DOE's approach for satisfying the interim remedial action obligation for a full-scale retrieval of OU 7-10, as called for in the OU 7-10 Interim Action ROD and to (2) achieve associated performance objectives that can be agreed on by the numerous stakeholders. To accomplish this, the OU 7-10 Stage III Project must perform the following:

- Design a system that can remediate (i.e., excavate, retrieve, characterize, treat, package, temporarily store, and prepare for transport) buried waste from OU 7-10 and, where practical for compatibility with anticipated retrieval elements of the pending OU 7-13/14 comprehensive ROD, from any TRU pit or trench in the SDA
- Construct the system at OU 7-10
- Develop and implement a Waste Isolation Pilot Plant (WIPP) -approved waste certification program
- Operate the system to remediate OU 7-10, including waste retrieval, characterization, segregation, treatment, and packaging
- Temporarily store the packaged waste, pending disposal
- Provide for final disposition of treated waste not returned to the excavation area (i.e., certification preparation for shipment to WIPP for final disposal)
- Provide for final disposition of waste retrieved by the OU 7-10 Glovebox Excavator Method Project, with the exception of waste that is transferred to the OU 7-13/14 Remedial Investigation and Feasibility Study for treatment studies
- Perform D&D&D of the project facilities and equipment after completion of remediation objectives (except those to be reused by the OU 7-13/14 Remedial Investigation and Feasibility Study)
- Design and implement an interim closure for the excavated area that includes return of acceptable waste to the pit and, where practical, is compatible with anticipated elements of the OU 7-13/14 comprehensive ROD final closure.

2.2 Project Assumptions

Assumptions for the preconceptual design phase of the OU 7-10 Stage III Project are summarized in Section 5 of the project mission analysis and definition document.[b]

2.3 Structure for Risk Management

The "INEEL Project Management System Requirements" (PRD-4) requires that an integrated project management system be used on all work activities. Risk management is an excellent mechanism to identify and integrate key project concerns into project planning and execution. A process for identifying, analyzing, and managing risks associated with a project is provided in GDE-70.

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b. INEEL, 2003, "Mission Analysis and Definition for the OU 7-10 Stage III Project (Draft)" INEEL/EXT-02-01507, Rev. 0B, INEEL.

This process focuses on small to medium projects and refers the reader to DOE Practice 8 for larger projects and more detailed risk analyses. Guidance from both sources was used in developing this plan.

2.3.1 Risk Categories

The OU 7-10 Stage III Project risk management process uses the categories listed below:

- Technology
- Interfaces
- Quality
- Safety and radiological
- Regulatory, environmental, and oversight
- Resources
- Site conditions
- Safeguards and security
- Procurement and contracting
- Management
- Work conditions.

2.3.2 Risk Types

The OU 7-10 Stage III Project risk management process also tracks the following risk types:

- Programmatic
- Technical
- Cost
- Schedule
- External.

2.3.3 Assessable Elements

The project assessable elements (see definition) to be considered during risk identification efforts are taken from Section 2 of the project system requirements document[c] and are listed in Table 2.

Table 2. Project assessable elements.

Element Number	Element Title
0	**OU 7-10 Stage III Project**
10	**Project execution**
11	Preconceptual phase
12	Conceptual phase
13	Title I design phase (including technology development)
14	Title II design phase
15	Construction (including turnover)
16	Testing and startup phase
17	Operations phase
18	Post-operations phase
19	Facility disposition phase (i.e., D&D&D)
20	Waste Retrieval
21	Waste and soil excavation and retrieval
22	Waste and soil characterization and assay
23	Waste and soil segregation and sorting
24	Soil Staging (pending return to pit)
25	Material handling and packaging (for ex situ storage or treatment)
26	Retrieval confinement
30	Treatment process
31	**Waste and soil ch**aracterization (for treatment path determination)
32	**Treatment for retu**rn to pit
33	**Treatment for disp**osal off-site (e.g., WIPP or Hanford)
34	Material handling
35	Treatment confinement
40	Waste disposition
41	**Waste and soil characteriz**ation (for disposition)
42	**Waste and soil packaging**
43	**Waste and soil storage (te**mporary)
44	**Material handling (includ**ing waste and soil return to pit)

c. INEEL, 2003, "System Requirements Document for the OU 7-10 Stage III Project (Draft)," INEEL/EXT 02-01537, Rev. A, INEEL.

Table 2. (continued).

Element Number	Element Title
45	Confinement (where applicable)
46	Waste shipment preparation, loading, and certification for final disposition
50	Close pit
51	Characterization (e.g., for residual risk and compliance to closure requirements)
52	Stabilization (e.g., returned waste, large object expectations)
53	Sorptive layer (bottom) installation
54	Soil cover installation
60	Transfer to OU 7-13/14
70	Cross-Cutting Functions and Systems
71	Power
72	Communications
73	Utilities (e.g., storm water drainage, sewer, steam, liquid natural gas or propane)
74	Fire protection or life-safety systems
75	Safeguards and security
76	Roads and grounds
77	Documentation and records

D&D&D = deactivation, decontamination, and decommissioning
OU = operable unit
WIPP = Waste Isolation Pilot Plant

2.4 Project Risk Management Team

The project risk management team will consist of core project positions, shown in Table 3, with additional subject matter experts participating as necessary in risk identification, analysis, and response planning.

Table 3. Composition of the project risk management team.

Position Title	Membership Status	Notes
Project manager	CM	—
Operations manager	CM	Not yet assigned
Project engineer	CM	—
Planning and controls engineering representative	CM	—
Applied system engineering lead and risk management coordinator	CM	—
Cost estimation representative	CM	—
Environmental representative	CM	—
Construction representative	AN	Not yet assigned
D&D&D representative	AN	Not yet assigned
Industrial safety and industrial hygiene representative	AN	Not yet assigned
Operations engineering representative	AN	Not yet assigned

Table 3. (continued).

Position Title	Membership Status	Notes
Procurement representative	AN	Not yet assigned
Quality assurance representative	AN	—
Radiological engineering representative	AN	Not yet assigned
Safety analysis representative	AN	—
Waste Generator Services representative	AN	Not yet assigned

AN = as necessary
CM = core member
D&D&D = deactivation, decontamination, and decommissioning

2.5 Responsibilities for Risk Management

The project manager has overall responsibility for project risk management and implementation, as well as content and approval of this plan. Activities required to implement the following responsibilities may be delegated; however, the responsibility remains with the identified project position.

2.5.1 Project Risk Management Team

The project risk management team is responsible for the following:

- Supporting the risk management process defined in this plan, including reviewing and reaching consensus on risk assessments as well as on proposed response actions to handle risks
- Ensuring that qualifying project risks are managed
- Assigning a risk owner to each risk that qualifies for management under this plan
- Reviewing project risk-analysis reports for accuracy and completeness
- Providing oversight and assuring consistency of risk management products and processes across project phases and risk categories, as necessary, by reviewing risk documentation, identifying inconsistencies, resolving issues, establishing guidance, and providing other support as needed
- Reviewing the project RMP for continuous improvement opportunities.

2.5.2 Project Manager

The project manager is responsible for the following:

- Ensuring that project risk management planning and execution is performed, including the development, approval, and implementation of the project RMP
- Leading the project risk management team meetings (or assigning a designee)
- Determining the frequency, attendance, and conduct of risk management meetings (or assigning a designee)

- Providing ultimate decision authority for risks to be tracked and mitigated by the project risk management process
- Approving closure of risk items when appropriate (e.g., on completion of risk-response actions and associated monitoring activities) (or assigning a designee)
- Participating on the project risk management team, particularly in identifying programmatic risks and establishing response actions to the following:
  - Mitigating programmatic risks
  - Mitigating risks arising from interfaces with other projects, INEEL organizations, or external entities (e.g., U.S. Department of Energy Idaho Operations Office [DOE-ID], U.S. Environmental Protection Agency, and the Idaho Department of Environmental Quality).
- Determining update frequency and schedule for the project risk analysis report
- Performing self-assessments of the risk management process and tools, and ensuring that needed changes are made in a timely manner.

2.5.3 Operations Manager

The operations manager is responsible for participating on the project risk management team and, particularly, in identifying and assessing operational risks and in establishing appropriate response actions to mitigate those risks.

2.5.4 Project Engineer

The project engineer is responsible for participating on the project risk management team, particularly in the following areas:

- Identifying and assessing technical risks and establishing appropriate response actions to mitigate those risks
- Identifying need and level of rigor for analytical risk analyses
- Assisting in determination of schedule and cost impacts.

2.5.5 Planning and Controls Engineering Representative

The planning and controls engineering representative is responsible for the following:

- Participating on the project risk management team and, particularly, for identifying sources of schedule risk, assessing schedule impacts of risk events, and preparing schedules for response actions
- Incorporating actions to implement risk-handling strategies into the project schedule, as appropriate

- Calculating, when necessary (e.g., based on available schedule float), technical and programmatic risk analysis (T&PRA) schedule contingency and incorporating this contingency into the project schedule
- Ensuring that applicable risk-handling strategy-implementation costs are incorporated into the project cost baseline
- Ensuring that appropriate contingency is incorporated into the project cost baseline.

2.5.6 Deactivation, Decontamination, and Decommissioning Representative

The D&D&D representative is responsible for participating on the project risk management team and, particularly, in identifying and assessing risks associated with shutdown, layup, and D&D&D phases of the project and in establishing appropriate response actions to mitigate those risks.

2.5.7 Applied System Engineering Lead and Risk Coordinator

The applied system engineering lead and risk coordinator is responsible for the following:

- Maintaining the project RMP including identifying necessary changes, preparing rewrites, and executing revisions.
- Ensuring that adequate documentation of the project risk management activities is created and maintained, including documentation generated from risk identification, assessment, response planning, action tracking and completion, and risk-item closure activities.
- Scheduling and facilitating project risk management team meetings.
- Maintaining a log of risk items and assigning unique risk-item tracking numbers.
- Reporting the status of project RMP implementation to project management, as requested.
- Ensuring that the project risk management database is maintained and that the risk-item data are kept up to date. (Note: This may be on a scheduled rather than a real-time basis.)
- Closing out risk items in the risk management database when authorized by the project manager.
- Ensuring that the project risk-response actions are entered into the project action item system for tracking through closure, including assignment of action owner(s).
- Initiating periodic reevaluation of risk items assessed as low risk.
- Preparing reports on the status of risk-response actions as requested by project management.
- Preparing or updating the project risk analysis report and submitting it to the risk management team for review and approval.
- Providing oversight for closing risk-response actions to ensure appropriate implementation and documentation has occurred.

2.5.8 Construction Representative

The construction representative is responsible for participating on the project risk management team and, particularly, in identifying and assessing construction risks and in establishing appropriate response actions to mitigate those risks.

2.5.9 Cost Estimation Representative

The cost estimation representative is responsible for the following:

- Participating on the project risk management team and, particularly, for assessing cost impacts caused by risks, preparing cost estimates for risk-item response actions, and for identifying sources of cost risk
- Calculating traditional contingency and T&PRA contingency values when requested by the project manager.

2.5.10 Subject Matter Experts

Subject matter experts are responsible to participate in the risk management process, representing their specific area of expertise, during activities of risk identification, assessment, and response planning.

2.5.11 Risk Owners (as assigned)

Risk owners are responsible, as assigned, for the following:

- Ensuring that risk management activities for assigned risk items are performed in a timely manner
- Performing initial assessments (i.e., quantification) of assigned risk items for review by the risk management team
- Proposing risk-handling strategies and associated response actions for assigned risk items
- Performing the residual risk quantification for assigned risk items
- Estimating risk impacts from implementation and residual risk for assigned risk items
- Ensuring implementation of risk-response plans for assigned risk items and maintaining knowledge of the current status
- Monitoring assigned risks for risk event occurrence and trouble triggers (including conditions that would indicate that the planned risk response may no longer be effective), as applicable, and notifying project management of these events
- Initiating closure of assigned risk items when all response actions have been completed and closed.

3. RISK MANAGEMENT PROCESS EXECUTION

According to DOE Order 413.3, an essential part of project planning is ensuring that project risks are identified, analyzed, and determined to have been eliminated, mitigated, or are manageable. Risk management provides the structured, formal, and disciplined approach, focused on the necessary steps and planning actions, to determine and control these risks to an acceptable level. In addition, DOE Order 413.3, with its attendant manual (DOE Manual 413.3-1 and associated practices), establishes a clear expectation that risk identification and analyses will be initiated as early as possible in the life of a project and be continued through succeeding project stages. This expectation is passed on to DOE contractors by the contractor requirements document within DOE Order 413.3, which requires that (1) project technical, cost, and schedule risks be identified, quantified, and mitigated (as appropriate), and (2) risk mitigation strategies be developed, documented, and implemented. Thus, project risk management is an iterative process where previously identified risks are monitored and new risks are identified at each CD point, or other established review points, to ensure risks have been satisfactorily managed. Implementation of the process will enhance the probability of project success by improving project performance and decreasing the likelihood of unanticipated cost overruns, schedule delays, and compromises in quality and safety.

3.1 General Approach

The risk management process described in this plan follows the general risk management process described in DOE Manual 413.3-1, Chapter 14, "Risk Management," as well as in DOE Practice 8. However, the general process has been tailored to suit the size, complexity, and unique attributes of the OU 7-10 Stage III Project and consists of the following major steps:

- Step 1: Risk management planning (including self-assessment for continuous improvement)
- Step 2: Risk identification
- Step 3: Risk quantification
- Step 4: Risk response (e.g., avoidance, reduction, mitigation, or acceptance)
- Step 5: Risk impact determination
- Step 6: Risk tracking and reporting.

Generally, it is intended that these process steps be completed sequentially with iterations of the complete process performed at each project phase to support CD approvals. However, in some cases, individual risk items should be addressed in a more real-time fashion. In such cases, the process can be initiated at Step 2 and proceed through Step 6, either immediately or on a scheduled basis, depending on the judgment of the risk coordinator, project manager, or the risk management team. Integration of steps in the overall risk management process is shown in Figure 3. Tailoring of the risk management steps and associated activities, including execution guidance, is provided in the following sections.

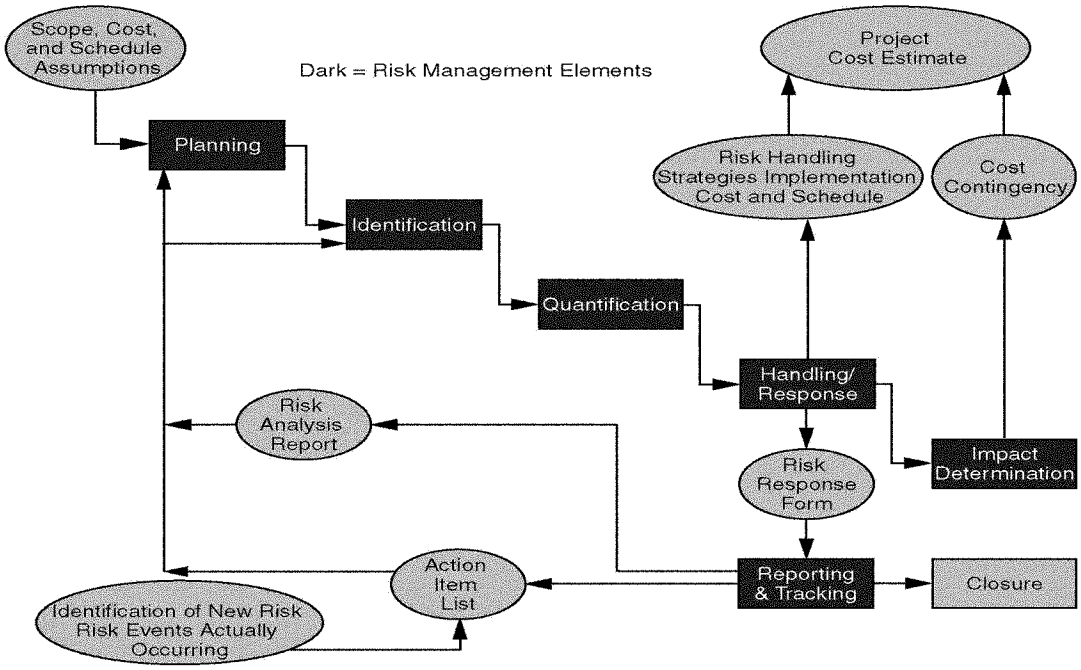

Figure 3. Risk management functional flow diagram (DOE 2000).

3.2 Step 1: Risk Management Planning

The risk management planning function includes activities necessary to establish and then maintain the project's process for managing risks. This project RMP represents the primary product of the risk management planning function. Maintenance of the plan is also an integral part of this function and is handled largely through informal reviews, self-assessments, and continuous improvement activities. Before each CD milestone, the plan will be reviewed informally to evaluate adequacy of the defined risk-management scope and activities for meeting the needs of the next project phase. This review should include an assessment of the following items produced during the most recent project phase:

- Risk documentation
- Response plan effectiveness
- Results of any self-assessment reviews
- Results of any continuous improvement activities.

If this review indicates that changes are necessary, then the plan will be revised using the INEEL document action request process.

Figure 4 illustrates the full set of activities performed within the risk management planning function. The project self-assessment and continuous improvement activities are described below:

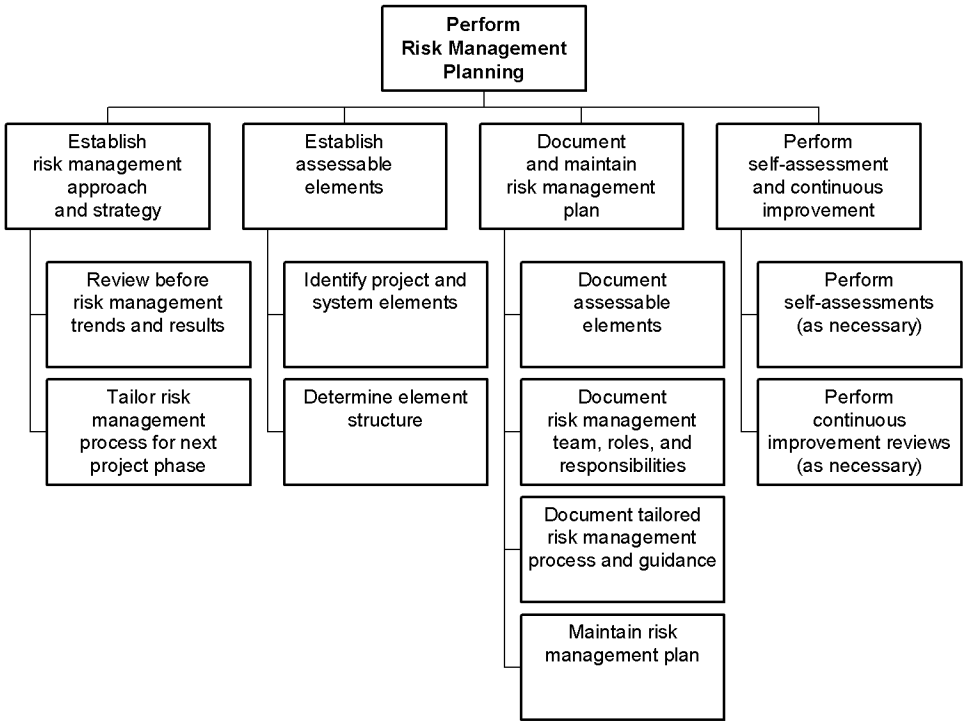

Figure 4. Risk management planning functions.

Management review and self-assessment actions are performed to measure the status of risk management plan implementation and its performance. These actions are a necessary part of the risk management planning function. Self-assessment activities are performed in accordance with applicable portions of MCP-8, "Self-Assessment Process for Continuous Improvement"; and MCP-9172, "Integrated Assessment Annual Planning, Scheduling and Reviewing." At a minimum, a self-assessment will be performed once per project phase, in preparation for CD milestone reviews, to ensure that the project RMP is adequate to meet the needs of the next phase. Intermediate assessments will be scheduled as necessary to ensure that the plan is properly implemented and being followed.

3.3 Step 2: Risk Identification

The purpose of the risk identification step is to identify events likely to affect successful completion of the project and to document specific characteristics with a basis describing why these events are considered a risk. Project risk identification will be performed using the structured approach described in this section. All identified above-normal risk items will be entered into the project risk management database and tracked through closure. The functions performed within this step of the project risk management process are illustrated in Figure 5. These functions include (1) identification of preliminary above-normal risks, (2) assignment of risk owners responsible for the risks through the risk life cycle, (3) documentation of risks to provide complete identification, including bases,[d] and (4) initiation of risk tracking.

d. Note that some risks may be eliminated here as either duplicates of existing risks, normal project risks, or external or nonassessable risks.

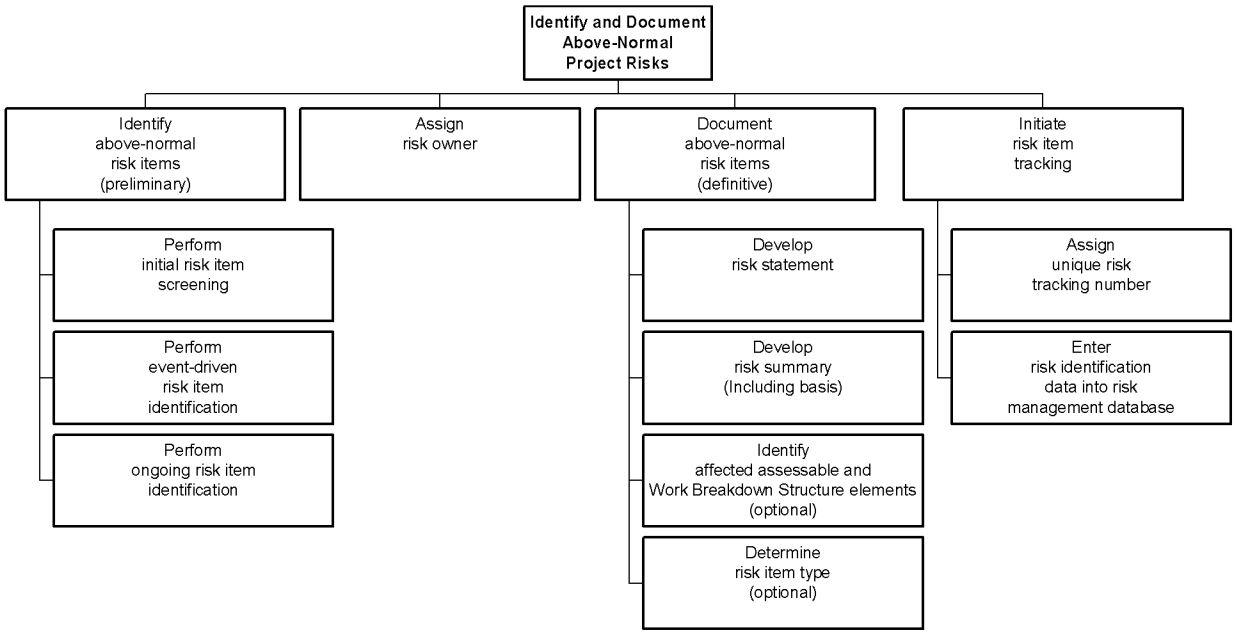

Figure 5. Risk identification functions.

3.3.1 Identification of Preliminary Risk Items

This plan defines the first function of the risk identification process step (i.e., identification of preliminary risk items) to include three main activities. The first activity is an initial screening (see Appendix A) to support development of appropriate project controls including risk management. The second activity, milestone-driven risk identification, links risk identification campaigns with specific project events (e.g., CD approvals). The third activity is ongoing risk identification, which is used to initiate management of risks that result from baseline changes or that arise between the event-driven risk identification campaigns.

3.3.1.1 Initial Risk Screening. As discussed in Section 1.1, the initial risk screening for the project is included as Appendix A to this plan.

3.3.1.2 Event-Driven Risk-Item Identification. Risk item identification may, at the request of the project manager or risk management team, be performed before and in support of the following types of project events:

- Project CDs
- Project performance reviews (by DOE-ID)
- External independent reviews
- Other reviews, as identified by the project manager.

At a minimum, risk-item identification should include a review of the project assessable elements, previous risk analysis reports, and project baseline documents, using one or more of the methods listed in Section 3.3.1.4 to identify new risks. Any newly identified risk items will be added to the risk management database and then submitted to the risk management team for assignment of a risk owner

and for appropriate processing. The new risk items are sent through the subsequent risk management process steps in a campaigned effort that results in an update of the project risk analysis report.

3.3.1.3 Ongoing Risk-Item Identification. As resources allow, limited risk identification may be performed during project execution in a more real-time manner. These efforts, for example, include the review of baseline change proposals, meeting minutes, and project audit and assessment results as they become available. At the project manager's discretion, risk items identified as a result of a baseline change or that arise between event-driven risk identification campaigns can be either (1) tracked pending the next event-driven risk identification campaign or (2) immediately processed and integrated into the project risk analysis report.

3.3.1.4 Methods and Tools for Risk-Item Identification. Several methods for identifying project risks are acceptable for use, including the following:

- Using risk-screening checklists (using either the project risk identification checklist from GDE-70 or the INEEL Form 431.56, "Engineering Change Technical Risk Screening," checklist as appropriate)
- Conducting surveys
- Interviewing subject matter expert
- Charting the process flows
- Reviewing documents (including review of lessons learned)
- Brainstorming with team members.

The risk identification and screening checklists are the preferred method because of their uniform, systematic approach and broad-based applicability.

3.3.2 Assignment of Risk Owner

The next function in the risk identification process step is to identify a risk owner for each risk item determined to pose above-normal project risk. This individual will have primary responsibility for the risk item and for ensuring that risk management activities are completed in a timely manner. If not otherwise assigned, the project manager will be the risk owner.

3.3.3 Documentation of Identified Risk Items

The information to be generated by the risk management team and documented during the risk identification process step includes:

- Risk title (mandatory)
- Risk statement (mandatory)
- Affected assessable element
- Affected Work Breakdown Structure element number (optional)
- Risk type (optional [e.g., programmatic, technical, cost, schedule, or external]).

Form 410.06, "Project Risk Identification and Response Plan," has been augmented for use on this project and will be used as a worksheet to document identified risk items (see Appendix B). Copies of this form will be available from the risk coordinator. This form will be used for identification of new risk items and a separate form will be completed for each risk item. In addition, after the information from Form 410.06 is entered into the risk management database and validated, the form is no longer considered to be current and may be discarded or retained, based on the judgment of the risk coordinator. The following guidance is provided for mandatory items to be documented as a part of this function.

3.3.3.1 Risk Title. The risk title should be concise and unique and typically, it should reflect the risk source and nature of the impact (e.g., volatile organic compound treatment, unsatisfactory technical performance).

3.3.3.2 Risk Statement. The risk statement should be a complete and definitive statement of the risk that includes corresponding risk bases. The risk statement should, as applicable, identify the following information:

- Significant potential risks that may adversely impact project cost, schedule, or scope, including events or conditions that (1) significantly impair the ability to execute the project, (2) prevent the facility from operating within time constraints or in compliance with state or U.S. Environmental Protection Agency regulations, or (3) cause the packaged waste to be rejected by the final disposal facility
- Why the risk is above normal
- Source area of the risk (e.g., activity, function, or assessable element)
- Event description
- How the event could happen (i.e., cause, causal factors, and causal chain)
- Expected frequency of the event and probability of occurrence
- When the event is likely to occur (e.g., project phase) or connections to other events
- Expected impacts or consequences, including the area(s) (i.e., activities, functions, or assessable elements) that could be impacted
- Mitigating factors, if any
- Where the event is likely to occur.

3.3.4 Initiation of Risk Item Tracking

Once an above-normal project risk has been identified, the risk coordinator, or designee, initiates risk-item tracking. The risk coordinator is responsible for maintaining a risk item log and for ensuring that all above-normal project risks are entered. The log is an informal project record that reflects the history of all risk items entered for tracking including those that have been closed. This log, at a minimum, will contain the data fields shown in Table 4. The applied systems engineer lead or project support staff is responsible for maintaining the log and ensuring all identified programmatic, technical, cost, and schedule risks are entered. The log is a project record reflecting the current status of each risk item as well as permanently retaining the information of risk items that have been closed.

Table 4. Risk item log data elements.

Data Element	Description	Element Type
Risk item number	A four-digit, unique identification number assigned sequentially as risk items are identified. Used for tracking risk items on this project.	Mandatory
Risk item title	Title of the risk item.	Mandatory
Assessable element	Project function or system to which the risk item applies. Refer to Section 2.3.2 for a list of assessable elements.	Optional
Date added	Date the risk item was added to the log.	Mandatory
Date closed	Date the risk item was approved for closure.	Mandatory, when closed
Risk item owner	Project team member assigned overall responsibility for the risk item. Default is the project manager.	Mandatory
Risk item status	Status of the risk item in the project risk management process used when producing risk item log status reports. Possible statuses include: • ID: Identified but being further defined • Assess: In analysis and quantification • Plan: In response planning • Monitor: Being monitored for trigger event • Open: Actively execution of risk response plan • Closed: All actions complete or overcome by events.	Mandatory
Risk type	Programmatic, technical, cost, schedule, or external.	Optional
Risk category	Refer to categories in Section 2.3.1.	Optional
Risk level	Risk level of the risk item (both qualitative and quantitative assessments result in the assigned risk level).	Mandatory, when assessed
Risk-item handling strategy	The risk-handling strategy identified for a particular risk item. • Accept • Avoid • Mitigate • Reduce • Special cases may require transfer, spreading, or decomposition • Not applicable.	Mandatory, after response planning
Trigger event monitoring flag	Yes or no flag indicating whether or not monitoring is necessary for trigger events.	Mandatory when recovery plans are specified for mitigating the risk
Notes	Comments, notes, and history relating to the risk item as it passed through the risk management process.	Optional

3.4 Step 3: Risk Analysis and Quantification

The two primary risk analysis and quantification methods used for the OU-7 Stage III Project are qualitative and quantitative assessment. Either of these primary methods may be used at the discretion of the risk management team. Both methods use the same criteria to rate the probability and consequences of occurrence (see Appendixes C and D); however, these ratings are expressed in either qualitative or quantitative terms. The ratings are then converted into a risk classification (i.e., high, moderate, or low) using separate criteria (see Table 5).

Table 5. Risk level assignment criteria (quantitative only).

Risk Factor = Probability × Consequence	Risk Level Descriptor
Less than 0.09	Low
Greater than or equal to 0.09 to 0.4	Moderate
Greater than 0.4	High

Alternate analysis and quantification methods are allowed, but are subject to approval by the project manager. If used, documentation of the following information is required:

- Analysis description and quantification methodology
- Any rating criteria used
- Resulting probability, consequence, and risk-level determinations (including associated bases). In addition, the risk level determinations must be substantially similar to those defined in the RMP.

Ultimately, selection of any particular method should be based on the nature of the risk, team judgment, and guidance provided in the following subsections. The functions performed within this step of the risk management process are illustrated in Figure 6.

3.4.1 Determine Type of Assessment and Document

3.4.1.1 Qualitative Risk Assessments. This method of risk quantification involves using qualitative scales to determine the probability of occurrence of a risk and associated consequences. The qualitative assessment method is typically preferred earlier in the project life cycle and for risk items that are broad, vague, nontechnical, or not otherwise suitable for quantitative or analytical assessment methods. The following steps will be followed when using this method.

1. Address each risk item individually. Verify that each risk item to be assessed is documented on Form 410.06 (see Appendix B).
2. Indicate assessment method (i.e., qualitative) by marking the appropriate box in the Risk Analysis and Quantification section of the form.
3. Determine the qualitative probability of occurrence rating for the risk item using criteria in Appendix C and mark the appropriate box on the form. This rating should reflect the risk condition before implementation of the risk-handling strategy.

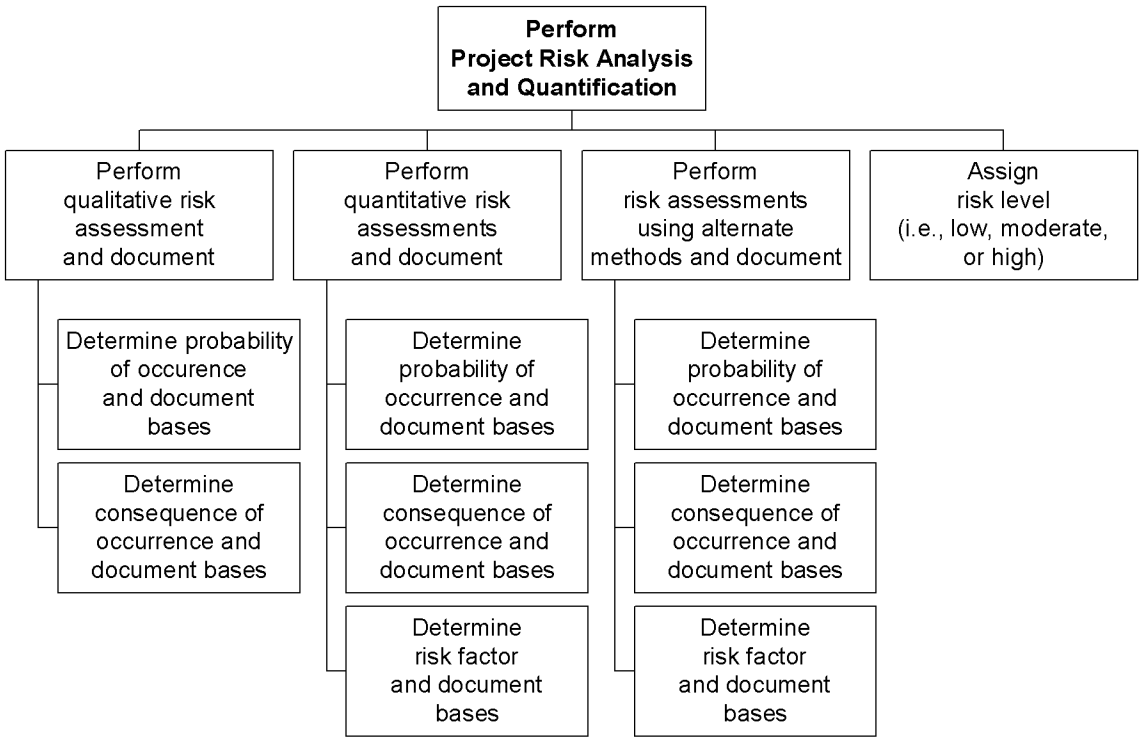

Figure 6. Risk analysis and quantification functions.

4. Document the basis for the probability of occurrence rating on the form. At a minimum, this should include a justification or rationale for the rating and whether it applies for the duration of all project phases or for the activity being assessed. The basis may also include:

   a. Historical occurrence data

   b. Actuarial table data

   c. Risk tree analysis documentation

   d. Delphi process results.

5. Determine the qualitative consequence of occurrence using criteria in Appendix D and mark the appropriate box on the form. This rating should reflect the risk condition before implementation of the risk-handling strategy.

6. Document the basis for the consequence-of-occurrence rating on the form. At a minimum, this should include a justification or rationale for the rating and whether it applies for duration of all project phases or for the activity being assessed. The basis also may include:

   a. Historical consequence date (e.g., anecdotal evidence from similar project, occurrence reporting processing system reports, and lessons learned)

   b. Cost estimates

c. Schedule analyses

d. Delphi process results.

7. Assign a qualitative risk level and mark the appropriate box on the form. The risk level is read directly from the risk level matrix (see Figure 7) located at the intersection of the row and column associated with the probability of occurrence and consequence of occurrence ratings, respectively.

8. Document on the form any additional notes relative to the assessment of the risk item.

Probability of Occurrence						
	Very likely	Moderate	Moderate	High	High	High
	Likely	Low	Moderate	High	High	High
	Unlikely	Low	Low	Moderate	Moderate	High
	Very unlikely	Low	Low	Low	Low	Moderate
		Negligible	Marginal	Significant	Critical	Crisis
		Consequence of Occurrence				

Figure 7. Risk level matrix (qualitative only).

3.4.1.2 Quantitative Risk Assessments. This method of risk quantification involves assigning quantitative values to event probability and consequence(s) for subsequent calculation of a numerical risk factor. The quantitative assessment method is typically preferred in early to middle project life cycle phases and for risk items that are specific, technical, or suitable for quantitative assessment based on available information but not requiring the rigor of analytical assessment methods. Quantitative assessment also provides a finer grading within the risk levels because of the numerical risk factor. The following steps will be followed when using this method.

1. Address each risk item individually. Verify that each risk item to be assessed is documented on Form 410.06 (see Appendix B).

2. Indicate the assessment method (i.e., quantitative) by marking the appropriate box in the risk analysis and quantification section of the form.

3. Determine the quantitative probability of occurrence value for the risk item using criteria in Appendix C and fill in the appropriate space on the form. This value should reflect the risk condition before implementation of the risk-handling strategy. Probability is expressed as a decimal between 0 and 1, when 0 is no probability of occurrence and 1 is certainty.

4. Document the basis for the probability of occurrence on the form. At a minimum, this should include a justification or rationale for the score and whether it applies for the duration of all project phases or for the activity being assessed. The basis may also include:

a. Historical occurrence data

b. Actuarial table data

c. Risk tree analysis documentation

d. Delphi process results.

5. Determinate the quantitative consequence of occurrence for the risk item using the criteria in Appendix D and fill in the appropriate space on the form. This value should reflect the risk condition before implementation of the risk-handling strategy. The consequence value is expressed as decimal.

6. After probability and consequence determinations have been made, a risk factor is calculated as the product of probability × consequence in accordance with guidance in DOE Practice 8. In general, calculations are made using the discrete factor values shown; however, exceptions can be made with appropriate basis and annotation. The calculated risk factor value then is used to assign the risk level in accordance with criteria identified in Table 5 and approved by the project manager. Risk levels influence tailoring of risk-specific handling strategies as discussed in the next section.

3.4.1.3 Alternate Risk Quantification Methods. As stated above, alternate analysis and quantification methods are allowed. Typical alterative methods include expected monetary value, expert judgment, simulation, and risk or decision trees. With the exception of expert judgment, these methods are typically used in later project phases when specific analytical or statistical results are desired. Use of these methods is subject to project manager approval and requires complete documentation of methodology; rating criteria (if any); probability, consequence, and risk determinations; and associated bases. Whichever method is used, the result should be a risk level determination of high, moderate, or low. This determination is documented on Form 410.06 for the risk item being assessed.

3.4.2 Determination of Probability-of-Occurrence Factor

The probability-of-occurrence criteria (see Appendix C) allows assignment of a descriptor for qualitative analysis or an associated numerical factor quantitative assessment. The four descriptors are (1) very unlikely, (2) unlikely, (3) likely, and (4) very likely. Most descriptors are associated with several possible numerical factors to provide additional gradation. In all, there are 13 discrete probability-of-occurrence-factor increments ranging from 0.01 through 0.99. In addition, it should be noted that these probability factors are qualitative rather than empirical (i.e., a factor of 0.5 is simply a grade and does not imply a 50% probability of occurrence within a specified time frame) and unitless.

3.4.3 Determination of Consequence-of-Occurrence Factor

The consequence-of-occurrence criteria (see Appendix D) allow assignment of an overall project impact using a descriptor for qualitative assessments or an associated numerical factor. For quantitative assessments, the five descriptors are (1) negligible, (2) marginal, (3) significant, (4) critical, and (5) crisis. Most descriptors are associated with several possible numerical factors. In all, there are 13 discrete consequence-of-occurrence-factor increments ranging from 0.01 through 0.99. It also should be noted that, like the probability of occurrence factors, the consequence factors are qualitative and unitless.

3.4.4 Assignment of Risk Level

The risk level assigned to a risk item during analysis and quantification is used to set an appropriate level of control relative to subsequent risk management activities. The level of control is generally reflected in the scope and detail of documentation, frequency of reporting, and levels of approval required.

3.5 Step 4: Risk Response

Risk response (also termed risk handling) is the identification of the course of action or inaction selected for the purpose of effectively managing a given risk. Performance of the risk-response step of the risk management process either documents that a given risk is acceptable to the project (as is) or defines those actions that will be taken to make an unacceptable risk acceptable to the project. Risk-handling methods are selected after the probable impact on the project has been determined so that handling strategies are appropriate for the level of risk (i.e., a graded approach that balances risk with other factors such as cost and timeliness). A risk-handling strategy is selected for all identified, above-normal project risks. The functions performed as part of the risk-response step of the risk management process are illustrated in Figure 8.

Typical risk-handling strategies are shown in Figure 9 (taken from DOE Practice 8); however, the preferred strategies to be used on the project are avoidance, reduction, mitigation, and acceptance. Other recognized risk-handling strategies also may be used when appropriate (e.g., risk transfer and risk spreading). The available risk-handling strategies are described in Section 3.5.1.

Risk owners are responsible for selecting the risk-handling strategy and, when required, developing the associated risk-response approach (including specific actions) for assigned risk items. The handling strategy, response approach (optional), and actions are documented on augmented Form 410.06 and presented to the risk management team. The assembled risk management team reviews all risk responses, making any necessary adjustments to reach team consensus. The agreed-on risk responses are noted on the risk forms, which then are used for data entry into the project risk management database and action tracking system by the risk coordinator, or designee. The following sections provide additional information to be used in performing the risk-response planning functions.

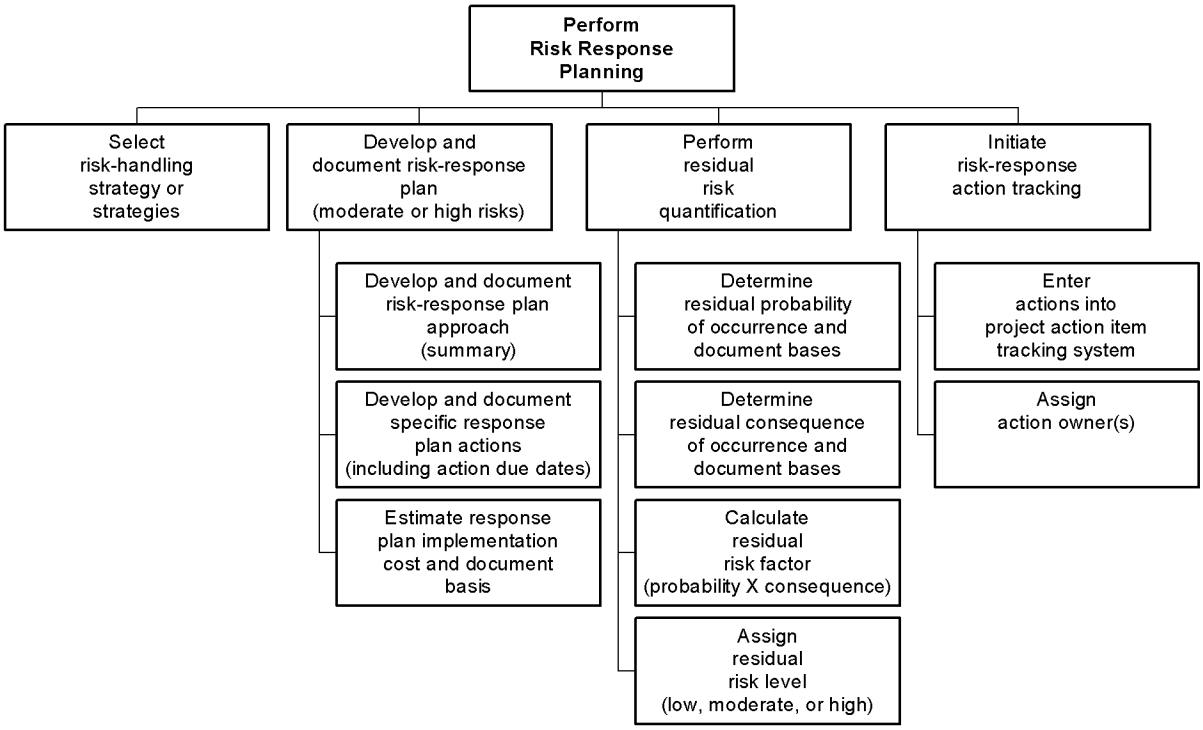

Figure 8. Risk-response planning functions.

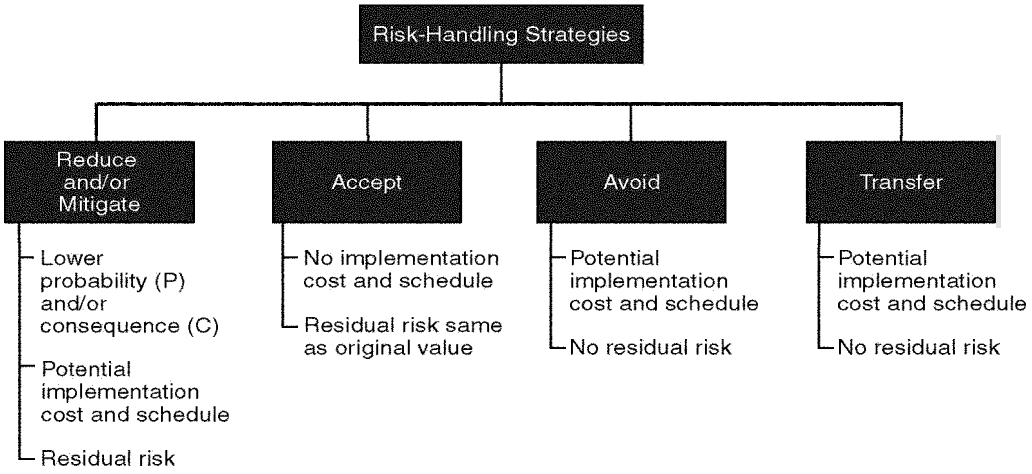

Figure 9. Risk-handling strategies (DOE 2000).

3.5.1 Selection of Risk-Handling Strategy

This section discusses the preferred and alternate risk-handling strategies available for managing above-normal project risks. These strategies are drawn from INEEL GDE-70 and DOE Practice 8. Section 3.5.1.6 provides additional guidance for making appropriate risk-handling strategy selections.

3.5.1.1 Risk Reduction. Risk reduction involves identifying specific steps or actions that will reduce the probability of occurrence of an adverse risk or increase the probability of occurrence of a potential benefit. This strategy is based on the definition of risk (i.e., risk is the product of a risk's probability and its consequences). Therefore, lessening the probability of occurrence will reduce project exposure to the particular risk by reducing the expected value of the outcome. Examples of risk reduction include the use of proven technologies, redundancy of design, or components of greater reliability. When this strategy is selected, the risk remains, but at a reduced level (i.e., residual risk). Project personnel also may need to consider and document the potential for implementation costs and schedule impacts.

3.5.1.2 Risk Mitigation. Risk mitigation involves identifying specific steps or actions that will lessen the consequence of a risk if it occurs. Like risk reduction, this strategy is based on the definition of risk. Therefore, lessening the consequence of occurrence will reduce the project's exposure to a particular risk by reducing the expected value of the outcome. Mitigation often can be accomplished by taking action before the event occurs (i.e., prevention) or by identifying actions to be performed after the event occurs (i.e., contingency or recovery planning). Examples of mitigation include (1) incorporating barriers or engineering controls into a design, (2) planning for and then executing work-arounds, (3) ensuring physical separation of primary and backup capabilities, and (4) prepositioning resources to be used in case of event occurrence (e.g., to reduce the response or recovery time). This strategy results in some residual risk and also has the potential for incurring implementation costs and schedule impacts.

3.5.1.3 Risk Acceptance. Risk acceptance is a no-action strategy. Selection of this strategy is based on the decision that it is more cost effective to continue the project as planned, with no additional resources (e.g., time and money) being allocated to control the risk. Low risks are typically accepted. When an *accept* handling strategy is employed, the risk level remains the same (i.e., residual risk equals initial risk), but no costs or schedule impacts are incurred for risk-response implementation.

3.5.1.4 Risk Avoidance. Risk avoidance focuses on total elimination of the specific threat, usually by eliminating the potential that the risk event can occur. This strategy requires a clear understanding of the root cause of the event. Examples of risk avoidance include totally redesigning a structure, system, or component or by selecting an alternate technology that is not subject to the same risk. When this strategy is selected, there is a potential for implementation costs and schedule impacts; however, the residual risk is reduced to zero.

3.5.1.5 Alternate Risk-Handling Strategies. Alternate risk-handling strategies include the following:

- Risk transfer (traditional definition): The risk transfer strategy, as used in this plan, involves shifting the entire risk to a third party, typically after the risk is converted to a monetary amount. Examples of this strategy include requiring performance bonds from subcontractors and purchasing insurance policies. For these two examples, the implementation cost is the incremental cost to the subcontract (if measurable) and the cost of insurance policy premiums, respectively. Typically, no residual risk remains after transfer.

- Risk spreading (includes transfer strategy as defined in DOE Practice 8): This strategy is used when a project risk or specific hazard can be reduced by (1) spreading it geographically, (2) spreading it between project elements, or (3) shifting it to another project or entity, especially when the risk or hazard is more easily accommodated within the receiving element, project, or entity. This strategy also includes the concept of distributing risk (either probability or consequence) through deliberate allocation of design margins, allowances, or contingency across system or subsystem interfaces. Examples of risk spreading include:

  - Increasing the distance between components that have the potential for interference or adverse interaction (i.e., electronic components and compressed gas and storage tanks)

  - Purchasing external products or services instead of using project or matrix organization resources to obtain better technology or a higher level of expertise

Note: In this specific example, caution must be exercised during supplier selection because the supplier could go out of business or fail to meet the agreed requirements, leaving the project with the same initial problem.

  - Reallocating design-to-cost margin or contingency to a component that has a high probability of missing its target value (or that will miss it by a large amount) from other components that have a significantly lower probability of missing their targets (or that have a significantly smaller consequence if those targets are missed).

When the risk-spreading strategy is selected, a potential exists for residual risk to remain as well as for costs and schedules to be impacted because of the response implementation.

3.5.1.6 Guidance for Risk-Handling Strategy Selection. Making good risk-handling strategy selections for project risks is vital. While several strategies can usually be used to control a risk, the simplest and most cost-effective strategy should always be sought. This requires a thorough understanding of the risk and its causes and consequences. Appendix E identifies guidance for the typical application of the risk-handling strategies used on this project. Appendix E also provides a summary of the strategies and identifies several examples of risk responses for each strategy. The purpose of

Appendix E is to aid risk owners in making appropriate risk-handling strategy selections by stimulating ideas for responding to individual risk events.

3.5.2 Developing and Documenting Risk-Response Plans

Response plans are required for risk items assessed at either the moderate- or high-risk level. Again, the risk response should reflect the application of a graded approach (i.e., establishing a justifiable level of effort relative to the risk level). For the same reason, risk items assessed as low should normally be handled using the accept-risk strategy and would not require a documented response plan. However, strategies other than *accept* can be used for low risks where a compelling argument can be made for doing so (e.g., if the risk can be handled without implementation cost or schedule impact). In such cases, the strategy used and the response plan should be documented on augmented Form 410.06. In all cases, the number of actions created (and requiring subsequent tracking) should be kept to the minimum necessary to implement the planned risk response to minimize administrative action-tracking costs.

Low-risk items handled by the accept-risk strategy are not eliminated from risk management. These risks are subject to periodic reevaluation as part of the risk identification process step that includes a review of previously identified risks. If a scheduled reevaluation is determined to be necessary by the risk management team, then an action for initiating a reevaluation should be placed into the project action tracking system as a tickler item. Risk tracking is discussed further in Section 3.7.2.

As mentioned previously, risk owners are responsible for developing risk-response plans for their assigned risk items. The response plans, including a summary of the approach (optional) and specific actions, are documented on augmented Form 410.06 and presented to the risk management team. The assembled risk management team reviews the plans, making necessary adjustments to reach team consensus. Changes to the proposed plans, if any, are noted on the risk forms, which then are used for data entry into the project risk management database and action tracking system by the risk coordinator, or designee.

The set of actions (documented on augmented Form 410.06) for responding to a given risk should be complete because the actions fully implement the selected strategy and achieve the desired level of control. When an action has been entered into the project action tracking system, the tracking number may be entered on the form in the designated location for subsequent data entry into the risk management database. Response actions should meet the following criteria:

- Ensure description is understandable when taken out of the response plan context
- Identify a single action
- Designate a single assignee or a single point of contact if multiple assignees are made
- Identify the action due date
- Indicate what must be accomplished or provided for closure of the action item (required for response actions to risk items rated as high, but recommended for all actions).

When post-event contingency or recovery actions are part of a risk-response plan (usually associated with the mitigation risk-handling strategy), the risk-event trigger should be identified so that

the actions can be activated in a timely manner. Monitoring of trigger points is discussed in further detail in Section 3.7.2.

3.5.3 Quantification of Residual Risk

As part of the risk-response planning function, the risk owner is responsible for quantifying and documenting the residual-risk level (i.e., estimated risk level assuming complete implementation of the handling strategy) for all assigned risks regardless of the initial risk level. Quantification of the residual risk is calculated using the same method as the initial risk quantification (qualitative, quantitative, or alternate). Residual risk is documented on augmented Form 410.06 for the risk item to record the effect of the response plan. If the risk level is not sufficiently reduced, project personnel may need to reevaluate the risk-response plan. Depending on the handling strategy selected, the residual risk level may be determined simply by inspection (e.g., for accepted risks or for avoided risks) or may require that the risk owner perform another qualitative analysis as described in Sections 3.4.1 through 3.4.4.

3.5.4 Initiation of Risk-Response Action Tracking

After agreement is reached by the risk management team on the risk-handling strategy, the response plan, and the residual-risk quantification; and the appropriate data entry into the risk management database has been performed, then the risk-response actions are entered into the project action tracking system. This system provides a means for assigning action owners and action due dates, issuing update notices, statusing progress on actions, and closing actions when completed.

3.6 Step 5: Risk Impact Determination

Risk impact determination is the process of evaluating and quantifying the effect of risk(s) on the project. Risk can impact the project in two ways:

- Implementation of the risk-handling strategy, which has the potential to impact the project baseline
- Residual risk, which has the potential to impact project contingency.

The risk-impact determination step of the risk management process ensures that the cost and schedule impacts from both of these sources are factored into the project cost and schedule baselines as well as associated contingency values. The risk impact determination functions are illustrated in Figure 10.

Risk owners perform an initial risk impact determination for assigned moderate and high risks. In cases where response plans have been developed for low risks, risk-impact determinations should be documented as well. The risk management team reviews these initial risk-impact determinations and necessary adjustments are made to reach team consensus. Changes to the impact determinations are noted on the applicable risk forms, which then are used for data entry into the project risk management database by the risk coordinator, or designee. The following sections provide additional guidance for performing risk-impact determinations.

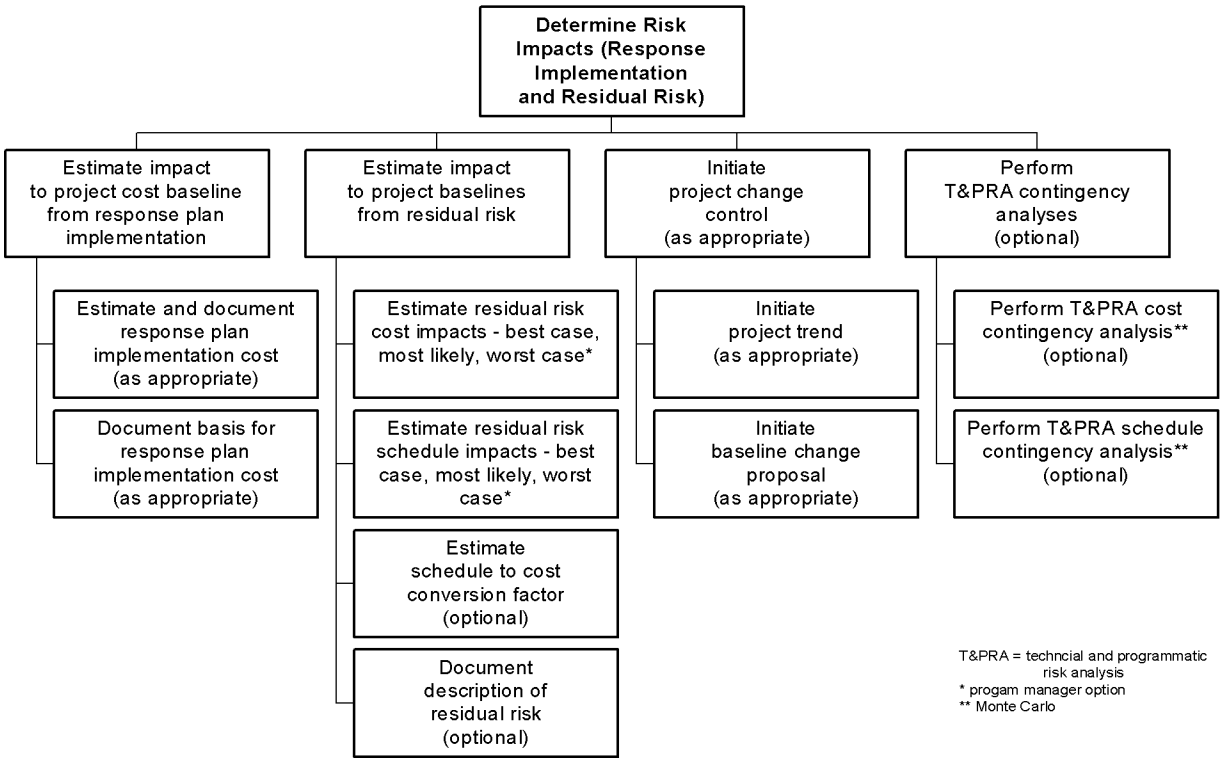

Figure 10. Risk impact determination functions.

3.6.1 Estimation of Impacts from Risk Response Implementation

After the risk-handling strategy and response actions have been determined, these should be reviewed to identify areas of additional cost (e.g., material, equipment, subcontract, or labor costs). If a significant[e] cost increase is identified, the estimated amount of the increase and the basis for the cost estimate is documented on augmented Form 410.06. For high risks having a significant response plan implementation cost, it is advisable to contact the project cost estimation representative for a formal cost estimate. The basis section of the form also can be used to document why there is no additional cost, when applicable.

3.6.2 Estimation of Impacts from Residual Risk

Estimation of impacts resulting from residual risk can involve identifying the best-case, most likely, and worst-case cost and schedule impacts if the risk event were to occur following implementation of the response plan. These values provide the basis for calculating T&PRA cost and schedule contingencies discussed in Section 3.6.4. Augmented Form 410.06 includes areas for documenting this information; however, the calculation of T&PRA schedule and cost contingencies will be at the discretion of the project manager. The section describing residual risk on augmented Form 410.06 is used to (1) link the risk and affected cost estimate line item(s) and to (2) link the risk and affected detail schedule activities.

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e. Significant, as used here, will be judged by the project manager and is subject to change based on such factors as available contingency, consistency of new scope with technical baseline, and actual-cost-to-budget performance.

3.6.3 Initiation of Change Control

Implementation of a given risk-response plan can have one of three impacts on the project baselines:

1. No impact, where an at-risk material is substituted without cost, quality, or schedule impact; or work within the scope is performed in a different manner only
2. Increased cost or task duration, where the risk-response action adds to the cost or duration of work that is within the project scope
3. Addition of new work scope.

When impacts (2) or (3) are involved, the project must initiate the appropriate change control mechanism (i.e., trend or baseline change proposal). Similarly, when a risk event occurs, appropriate change control actions are initiated if the project baselines are affected.

3.6.4 Analysis of Technical and Programmatic Risk Analysis Contingencies

Technical and programmatic risk analysis for contingency is optional. Supporting data may be collected and recorded on Form 410.06 and entered into the project risk management database for potential future use. If deemed necessary by the project manager, then T&PRA analysis can be performed as described in DOE Practice 8.

3.7 Step 6: Risk Reporting, Tracking, and Closure

The risk reporting, tracking, and closure step of the risk management process includes the functions shown in Figure 11 and described in the following sections.

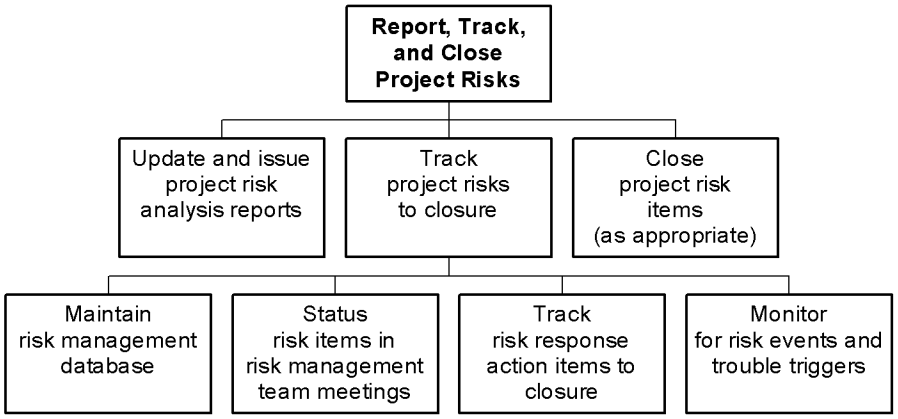

Figure 11. Risk reporting, tracking, and closure functions.

3.7.1 Risk Reporting

Risk reporting is the documentation of the risk identification, quantification, response, and impact determination activities for the project in a risk analysis report. This report is updated periodically by the risk coordinator, or designee, and is used in future risk-analysis activities. At a minimum, the risk analysis report includes the following items:

- Management summary (including a risk summary table)

- Risk item log
- Detailed risk sheets (output reports from the risk management database)
- Other risk information, as deemed relevant and beneficial.

Risk information is the responsibility of the risk coordinator and is maintained in the project risk management database. This database provides the basis for the risk analysis report and also contains files on risk items that have been closed.

3.7.2 Risk Tracking

Risk tracking is the active monitoring of identified risks, the action items developed from the risk-handling strategies, and the identification of a need to evaluate new risks or reevaluate changes in previously identified risks.

Tracking individual risk items is accomplished using the following mechanisms:

- Project risk management database where all above-normal project risks are entered and maintained until closure. Records of past risk items remain in the database after closure.
- Risk management team meetings where risks are reviewed, assigned, and coordinated.
- Monitoring for risk-event occurrence and trouble triggers (see definition) by the risk owners. These triggers may indicate the imminent occurrence of the risk event, establish that the event has actually occurred, or that the response plan may no longer be effective in controlling the risk.

Tracking individual risk-response actions is accomplished using the project action tracking system. The risk coordinator (or designee) is responsible for ensuring that action items from risk-response plans are assigned an owner and entered into the action tracking system for maintenance through closure. Action notifications, updating, and closure are managed in accordance with the provisions of that system.

3.7.3 Risk Closure

Closure of the risk items by the risk coordinator can occur when the following conditions have been met:

- All response plan actions have been completed and closed
- Monitoring of risk event occurrence or trouble triggers is no longer necessary
- Reevaluation of the risk no longer provides any benefit (i.e., the window of opportunity risk or event occurrence has passed)
- Project manager concurrence is obtained for closure (high and moderate risks only).

4. REFERENCES

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GDE-70, 2003, "Guide for General Project Management Methods," Rev. 10, Idaho National Engineering and Environmental Laboratory.

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Appendix A

Operable Unit 7-10 Stage III Project Initial Risk Screening Report—Preconceptual Phase

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Appendix A

Operable Unit 7-10 Stage III Project Initial Risk Screening Report—Preconceptual Phase

PURPOSE

This appendix documents an initial risk screening of the proposed Operable Unit (OU) 7-10 Stage III Project current with the preconceptual phase. The attached checklist identifies areas of potential risk as determined by the risk evaluation team.

RISK EVALUATION TEAM

Members of the risk evaluation team and associated functional areas of responsibility are listed in Table A-1.

Table A-1. Risk evaluation team members and functional areas of responsibilities.

Name	Function
Stephanie L. Austad	Project engineering
Jeffrey D. Bryan	Applied systems engineering
Brent N. Burton	Environmental compliance
William H. Landman	Project engineering
Brandt G. Meagher	OU 7-13/14 point of contact
Stephanie Walsh	Design engineering
David E. Wilkins	Project management

OU = operable unit

ASSUMPTIONS

The following assumptions were made as a basis for this initial risk screening.

1. Operable Unit 7-10 Stage III Project is defined as documented in the "Mission Analysis and Definition for the OU 7-10 Stage III Project (Draft)"[f] submitted for review by the U.S. Department of Energy Idaho Operations Office, the U.S. Environmental Protection Agency (EPA), and the Idaho Department of Environmental Quality (IDEQ).

Note: The Mission Analysis and Definition document (see footnote f) contains a list of major assumptions for the OU 7-10 Stage III Project.

f. INEEL, 2003, "Mission Analysis and Definition for the OU 7-10 Stage III Project (Draft)" INEEL/EXT-02-01507, Rev. B, INEEL.

2. Waste measuring greater than 100 nCi/g TRU contaminants is treated only for waste Isolation Pilot Plant (WIPP) acceptance and for cost-effective volume reduction. The WIPP waste acceptance criteria are assumed to be modified to allow acceptance of polychlorinated biphenyl-contaminated waste (i.e., greater than 50 ppm).

3. Waste measuring less than or equal to 100 nCi/g TRU and containing contaminants of concern for OU 7-13/14 for human and ecological exposures at concentrations greater than threshold levels (to be determined) will not be returned to the pit unless treated or will be stored pending determination of an alternate disposal path.

4. Remote-handled waste and excepted large objects will not be retrieved and will remain in the pit. In situ stabilization of these waste forms may be necessary.

5. Evaluations of areas having a potential for risk represent the following:

   - Greatest risk across all project phases (i.e., preconceptual planning through deactivation, decontamination, and decommissioning [D&D&D] and pit closure).

   - Greatest risk across all conceptual design alternatives for confinement, retrieval, and treatment (i.e., highest risk regardless of alternative rather than an assessment of only the baseline alternative).

   - Use of the OU 7-10 Stage III system or design for performing additional retrievals in the SDA under the OU 7-13/14 comprehensive record of decision (due in April 2006 in accordance with the accelerated schedule).

RESULTS

This screening determined that the preconceptual phase of the OU 7-10 Stage III Project has an overall medium/high potential for risk. See the risk-screening checklist in Section 5 for a breakdown of the risk screening categories and ratings.

RISK SCREENING AND IDENTIFICATION CHECKLIST AND RISK CATEGORY LIST

Table A-2 contains the project's Preconceptual Risk Screening Checklist that was completed on April 17, 2003.

Table A-2. Preconceptual Risk Screening Checklist.

	RISK CATEGORIES	Risk Type	POTENTIAL FOR RISK?		
			No	Yes	
				Low	Medium/High
1.	**TECHNOLOGY**				
	New technology? [Some design elements will require additional TD – e.g., radioassay > 83 gal.]	T	☐	☐	☒
	Unknown or unclear technology? [Some design elements will require additional TD – e.g., radioassay > 83 gal.]	T	☐	☐	☒
	New application of existing technology? [Some design elements will be first-of-a-kind in this application – i.e., TRU retrieval]	T	☐	☐	☒
	Involves modernized/advanced technology in existing application? [Where existing technologies are adapted for TRU retrieval]	T	☐	☒	☐
	Significant modification of existing technology? [Some elements require adaptation to remote operations]	T	☐	☒	☐
	Technical strength of the performing engineering team inadequate? [Addressed through Acquisition Strategy]	T	☐	☒	☐
	Efficient application of existing technology? [Some elements require additional development]	T	☐	☒	☐
	Other? [Unknowns in pits]		☐	☐	☒
2.	**INTERFACES**				
	Multiple systems? [Confinements, ventilation, treatment, excavation, etc.]	T	☐	☐	☒
	Multiple project interfaces (external)? [Various; GEMP, OU 7-13/14, INTEC lab, BNFL, WIPP, ICDF, etc.]	T	☐	☐	☒
	Multiple technical organizations? [Various design disciplines]	P	☐	☒	☐
	Multiple projects? [e.g., retrieval, treatment, and storage]	P	☐	☐	☒
	Multiple customers? [DOE, operations, and stakeholders]	P	☐	☐	☒
	Multiple end users? [Operations]	P	☒	☐	☐
	Multiple agencies/contractors? [EPA/IDEQ, one primary but multiple subs]	P	☐	☒	☐
	Near Safety Class systems? [Likely to be safety-significant only]	T	☐	☒	☐
	Interface with operating SSCs during installation/testing? [RWMC utilities]	T	☐	☒	☐
	Special work control/work authorization procedures? [STD-101]	T	☒	☐	☐
	Co-occupancy of facilities required? [RWMC office space/field trailers]	P	☐	☒	☐
	Potential for operational activities to have priority over project activities? [Funding]	P	☐	☒	☐
	Outage requirements? [BNFL, RWMC utilities]	P	☐	☒	☐
3.	**QUALITY**				
	Does NQA-1 or DOE RW-0333P apply? [NQA-1]	T	☐	☒	☐
	Precision work required? [Confinement boundaries, e.g., gloveboxes]	T	☐	☒	☐
	Rework expected due to nature of tolerances? [Possible; e.g., leak testing, to meet Remedial Action Objectives]	T	☐	☒	☐

Table A-2. (continued).

	RISK CATEGORIES	Risk Type	POTENTIAL FOR RISK?		
	Significant quality work that is (or will be) inaccessible?	T			
	SAFETY/RADIOLOGICAL (see also Category 13 below)				
	Criticality potential? [Will require management]	T	☐	☒	☐
	Any impact to the Facility Authorization Basis (e.g. new DBAs or USQs generated)? [new for facility at RWMC; also due to unknowns in pit]	T	☐	☒	☐
	Hazardous material involved? [RCRA hazardous materials]	T	☐	☐	☒
	Confinement strategies required? [Radiological and hazardous]	T	☐	☐	☒
	Will hazardous materials inventories exceed the OSHA TQs? [Possibly; for manned entries into confinement]	T	☐	☒	☐
	Fire watch required? [Possible, during construction or sprinkler testing - ordinary]	T	☒	☐	☐
	Emergency Preparedness impacts/concerns? [Ordinary]	T	☐	☒	☐
	Is low-level waste, TRU waste, or HLW involved? [Definitely LLW and TRU; low probability of RH waste, spent fuel, and other HLW]	T	☐	☐	☒
	Radiological conditions (current and future) - Contamination? [High levels of alpha] - Radiation? [Potential for high beta/gamma, Pit 7, OU 7-13/14]	T	☐	☐	☒
	Significant exposure/contamination potential? [see above]	T	☐	☐	☒
	Other?				
	REGULATORY/ENVIRONMENTAL/OVERSIGHT				
	Environmental assessment/impact statement required? [CERCLA]	P or S	☒	☐	☐
	Potential for additional environmental releases? [TRU waste retrieval]	T	☐	☐	☒
	Undefined disposal methods/potential for orphan wastes? [Both orphan and NDP wastes are possible]	T	☐	☐	☒
	Permitting required? [CERCLA; substantive requirements only]	T	☐	☒	☐
	State inspections? [IDEQ oversight, regulatory compliance]	T or P	☐	☒	☐
	Regulatory oversight? [Regulatory meetings, EPA, IDEQ]	P	☐	☐	☒
	Agency (i.e., EPA, State, NRC, or DNFSB) participation in decision-making? [FFA/CO]	P	☐	☐	☒
	DOE Order compliance? [TBCs and contractual]	T or P	☐	☒	☐
	Performed in a CERCLA/RCRA-permitted facility? [CERCLA]	T	☐	☒	☐
	Mixed waste involved? [OU 7-10 inventory]	T	☐	☒	☐
	Uncharacterized waste involved? [Unknowns in pit]	T	☐	☐	☒
	INEEL Oversight Committee/Citizens Advisory Board participate/influence decision-making? [CAB, etc.]	P	☐	☒	☐
	Other?				

Table A-2. (continued).

	RISK CATEGORIES	Risk Type	POTENTIAL FOR RISK? No	Yes Low	Yes Medium/High
6.	**DESIGN**				
	Undefined, incomplete, or unclear functions or functional requirements? [ROD, OU 7-13/14]	T	☐	☐	☒
	Undefined, incomplete, or unclear design criteria? [TBD]	T	☐	☐	☒
	Numerous or unclear assumptions? [See Mission Analysis & Definition]	T	☐	☐	☒
	Numerous or unclear engineering change bases? [Ordinary]	T	☐	☒	☐
	Special or unusual engineering analyses required? [Ordinary]	T	☐	☒	☐
	Complex design features? [For example: confinement, robotics]	T	☐	☐	☒
	Reliability issues? [Components inside confinement]	T	☐	☐	☒
	Inspectability/testability issues? [Components inside confinement]	T	☐	☐	☒
	Maintainability issues? [Components inside confinement]	T	☐	☐	☒
	Availability issues? [Components inside confinement]	T	☐	☒	☐
	Operability issues? [Components inside confinement]	T	☐	☐	☒
	Safety Class systems? [Safety-significant only (as yet)]	T	☐	☒	☐
	Errors and omissions in design? [Ordinary]	T	☐	☒	☐
	Other?				
7.	**TESTING**				
	Construction turnover/other testing required? [Off-site fabrication to delay start of construction to as late as possible (ALAP).]	T	☐	☐	☒
	Subcontractor acceptance/other testing required? [Off-site fabrication to delay start of construction to ALAP.]	T	☐	☐	☒
	Facility startup testing required? [Off-site fabrication to delay start of construction to ALAP.]	T	☐	☐	☒
	Maintenance testing required? [Off-site fabrication to delay start of construction to ALAP; remote maintenance]	T	☐	☐	☒
	SO, system startup, and/or integrated testing required? [Off-site fabrication to delay start of construction to ALAP]	T	☐	☐	☒
	Difficult to perform functional test? [After commencement of operations]	T	☐	☐	☒
	Other?				
8.	**RESOURCES / SITE CONDITIONS**				
	Adequate and timely resources not available? [Concerns regarding several skills – including RCTs and operators]	T or P	☐	☐	☒
	Specialty resources required? [Physics R&D support personnel]	T or P	☐	☒	☐
	Adequate and timely material/equipment resources not available? [Long lead items]	T or P	☐	☐	☒
	Existing utilities above and underground? [Ordinary – fire water, storm sewer]	T	☐	☒	☐

Table A-2. (continued).

	RISK CATEGORIES	Risk Type	POTENTIAL FOR RISK?		
			No	Yes	
				Low	Medium/High
	Adequate and timely support services not available? [Laboratory, RCT support]	T or P	☐	☐	☒
	Geological conditions? [Retrieval facility stability – built on pit]	T	☐	☐	☒
	Geographic conditions? (e.g. distributed work locations)? [Retrieval, treatment, and storage]	T or P	☐	☐	☒
	Temporary resources (power, lights, water, etc.) required? [Construction, semi-permanent for operations facilities]		☐	☒	☐
	Construction/operations complexities present?				
	- Transportation complexity? [Space limitations]	T	☐	☒	☐
	- Critical lifts required? [Possible during construction and if large objects require relocation]	T	☐	☐	☒
	- Population density? [Ordinary]	T	☐	☒	☐
	Escorts required? [Radiation area, construction]	P	☐	☒	☐
	Personnel training and qualifications required? [Nuclear facility/operations]	T or P	☐	☒	☐
	Adequate and timely tools/equipment controls not available? [Ordinary]	T	☐	☒	☐
	Experience with system/component (design, operations, and maintenance)? [Likelihood for multiple new operators]	T	☐	☐	☒
	Work force logistics complexities (e.g., rapid build up required)? [Rapid build-up and release]	P	☐	☐	☒
	R&D or Technology Development support required? [Cost impacts; assay]	P	☐	☐	☒
	Lockout/tagout support required? [Ordinary]	T	☐	☒	☐
	Facility work control priorities impacted? [AMWTP, LMAES D&D&D]	T or P	☐	☒	☐
	Multiple projects/facilities involved in site logistics? [Multiple project facilities, AMWTP]	T or P	☐	☒	☐
	Facility infrastructure impacted requiring major improvements? [Propane, acid, power, water, sewer, roads, and storm water]	T or P	☐	☒ [Pit 9]	☒ [Other pits & trenches]
	Analytical laboratory resources not available? [Sample analysis turnaround, WIPP certification]	P	☐	☐	☒
	Other?				
9.	**SAFEGUARDS AND SECURITY**				
	Category I nuclear materials involved?	T	☒	☐	☐
	Classified process or information involved? [Cannot be ruled out]	T or P	☐	☒	☐
	Special physical security measures required? [Ordinary]	T or P	☐	☒	☐
	Safeguards or security concerns involved? [SDA, potential]	T	☐	☐	☒
	Other?				

Table A-2. (continued).

	RISK CATEGORIES	Risk Type	POTENTIAL FOR RISK?		
			No	Yes	
				Low	Medium/High
10.	**PROCUREMENT**				
	Procurement strategy undefined or complex? [Ordinary]	P	☐	☐	☒
	First-use subcontractor/vendor involved? [Probable, first-of-a-kind application]	P	☐	☐	☒
	Adequate and timely vendor support not available? [Potentially]	P	☐	☐	☒
	Limited availability of qualified vendors or subcontractors? [Probable]	P	☐	☐	☒
	Sole source procurement required? [Probable]	P	☐	☐	☒
	Long-lead procurement items? [Probable]	P	☐	☐	☒
	Other?				
11.	**CONSTRUCTION STRATEGY**				
	Turnover/start-up complexities? [Ordinary]	P	☐	☒	☐
	Direct hire/subcontractor complexities? [Ordinary]	P	☐	☒	☐
	Construction/maintenance testing complexities? [Ordinary]	P	☐	☒	☐
	Design change package issues? [Anticipated high volume]	P	☐	☒	☐
	Construction unique to the standard INEEL practice? [Over the pit]	P	☐	☐	☒
	Other? [LMAES and GEMP D&D&D, undocumented waste disposal sites]	P	☐	☐	☒
12.	**MANAGEMENT**				
	Funding				
	Funding availability uncertainties? [For full scope]	P	☐	☐	☒
	Multiple funding sources (e.g., State and Federal)?	P	☒	☐	☐
	Funding provided by foreign countries?	P	☒	☐	☐
	Project supporting a DOE low-priority program?	P	☒	☐	☐
	Errors and omissions in estimates? [Ordinary for this phase of the project]	P	☐	☐	☒
	Stakeholder program strategy changes? [Response to court ruling, LMAES litigation]	P	☐	☐	☒
	Fast track/critical need? [Design]	T or P	☐	☐	☒
	Infrastructure issues (e.g., processes, procedures, systems)? [Ordinary]	P	☐	☒	☐
	Potential for schedule deferrals? [For portions of scope due to funding]	P or S	☐	☐	☒
	Potential for schedule accelerations? [For example, early actions initiative]	P or S	☐	☐	☒
	Management acceptance of identified risk w/o mitigation? [Ordinary]	P	☐	☒	☐
	Technical scope uncertainties? [ROD original scope, MAD, OU 7-13/14, etc.]	P	☐	☐	☒
	Technical roles and responsibilities not well established? [Ordinary]	P	☐	☒	☐
	Potential for changes in priority? [OU 7-13/14 ROD finalization]	P	☐	☐	☒

Table A-2. (continued).

	RISK CATEGORIES	Risk Type	POTENTIAL FOR RISK? No	Yes Low	Yes Medium/High
	Potential for changes in strategy? [For example, engineering design acquisition strategy]	P	☐	☐	☒
	Potential for changes in project team members? [ICP contractor change]	P	☐	☐	☒
	Other?				
13.	**WORK CONDITIONS RESULTING IN UNUSUAL APPLICATIONS OF GENERAL SITE SAFETY STANDARDS**				
	Potential for personnel injury				
	Heat stress?	T or P	☒	☐	☐
	Exposure to cold?	T or P	☒	☐	☐
	Industrial hazards? [Ordinary]	T or P	☐	☒	☐
	Process hazards? [Treatment systems]	T or P	☐	☒	☐
	Use/creation of carcinogens? [Exposure to hazardous waste]	T or P	☐	☒	☐
	Confined space work? [Ordinary, will depend on design]	T or P	☒	☐	☐
	Air quality (indoor/outdoor)? [Ordinary, will depend on design]	T or P	☒	☐	☐
	Exposure to biohazards?	T or P	☒	☐	☐
	Exposure to blood borne pathogens?	T or P	☒	☐	☐
	Work elevation hazards? [Ordinary, proximity to excavation]	T or P	☐	☒	☐
	Personnel protection complexities				
	Adequate and timely access to medical supplies/facilities/personnel not available? [Ordinary]	T or P	☒	☐	☐
	Adequate and timely protective equipment not available? [Ordinary]	T or P	☒	☐	☐
	Vehicular hazards				
	Traffic patterns?	T or P	☒	☐	☐
	Traffic control?	T or P	☒	☐	☐
	Pedestrian areas?	T or P	☒	☐	☐
	Unusual vehicles? [Automatic guided vehicles (AGVs)]	T or P	☐	☒	☐
	Explosion potential? [Unknowns in pit, treatment processes]	T or P	☐	☒	☐
	Ergonomic issues				
	Work outside field of vision [Glovebox use probable]	T or P	☐	☒	☐
	Work beyond standard reach? [Glovebox use probable]	T or P	☐	☒	☐
	Weather/climate conditions (impact to temp. sensitive equipment/controls)? [Temperature can be regulated inside confinement]	T or P	☒	☐	☐
	Natural phenomena hazards? [Standard]	T or P	☐	☒	☐
	Other?				

Table A-2. (continued).

	RISK CATEGORIES	Risk Type	POTENTIAL FOR RISK? No	Yes Low	Yes Medium/High
14.	**OTHER MISCELLANEOUS**				
	Schedule				
	Schedule uncertainties that might impact on-time completion? [OU 7-10 ROD amendment, OU 7-13/14 ROD]	S	☐	☐	☒
	Adverse weather conditions cause delays that significantly impact schedule? [Ordinary]	S	☒	☐	☐
	Duration greater than 5 years? [> 5 years from design thru D&D&D]	S	☐	☒	☐
	Long-lead procurement on critical path? [Retrieval equipment, treatment unit ops]	S	☐	☐	☒
	Cost/Budget				
	Duration greater than 5 years? [> 5 years from design thru D&D&D]	C	☐	☒	☐
	Cost baseline based on uncertain or high level estimates? [LCB estimate – pre-conceptual]	C	☐	☒	☐
	Cost items subject to higher than normal cost fluctuations? [Fuels, sole-source equipment]	C	☐	☒	☐
	Errors and omissions in schedule/cost estimates? [Project phase]	S or C	☐	☒	☐
	Housekeeping?	P	☒	☐	☐
	Political issues or opposition? [Thermal units, radioactive air emissions]	P	☐	☐	☒
	Will advocacy organizations (e.g., Sierra Club, Greenpeace) take interest? [KYNF thermal treatment opposition, SRPA interest in removal]	P	☐	☐	☒
	Other?				

Risk Type Key: T = Technical; P = Programmatic; S = Schedule; C = Cost

15. Results of Risk Screening: ☐ Low ☒ Medium/High

Analyst: Jeffrey D. Bryan (Printed/Typed Name) Jeffrey D. Bryan (Signature) 6-19-03 (Date)

16. PM: David E. Wilkins (Printed/Typed Name) David E. Wilkins (Signature) 6-19-03 (Date)

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Appendix B

Project Risk Identification and Response Plan (Form 410.06, as modified for the OU 7-10 Stage III Project)

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Appendix B

Project Risk Identification and Response Plan (Form 410.06, as modified for the OU 7-10 Stage III Project)

This appendix provides a version of Form 410.06, "Project Risk Identification and Response Plan," which has been augmented specifically for the Operable Unit (OU) 7-10 Stage III Project and will be used as a worksheet to document identified risk. Specific instructions for using this form also are included. This form will be used to identify new risk items and a separate form will be completed for each risk item. In addition, after the information from this form has been entered into the risk management database and validated, the form is no longer considered to be current and may be discarded or retained based on the judgment of the risk coordinator. Guidance in Sections 3.3.3.1 and 3.3.3.2 of the *Risk Management Plan* is provided for the mandatory items to be documented as a part of this function.

Project Risk Identification and Response Plan (Form 410.06, as modified for the OU 7-10 Stage III Project)

Project Title: _____ Date: _____

Identified Risk: _____

Risk Owner: _____ Risk No.: _____

NOTE: *Use one form for each identified potential significant risk. See GDE-70, "General Project Management Methods," for additional guidance on identifying, analyzing, and responding to risk.*

OU 7-10 Stage III Augmented Form 410.06
(**Rev. 0,** January 2, 2003)

Description of Risk: (summarize risk, consequences, probability, risk factor)

RISK IDENTIFICATION SECTION

A. Risk Statement (short description):

B. Risk Summary (description of risk including details on causal event and associated impacts):

C. Affected Assessable Element (optional-refer to plan Section 2.3.2):

D. Affected Work Breakdown Structure Number (optional):

E. Risk Type (optional - Programmatic, Technical, Cost, Schedule, or External): ☐ **P** ☐ **T** ☐ **C** ☐ **S** ☐ **E**

RISK ANALYSIS AND QUANTIFICATION SECTION

F. Assessment Method (check one): ☐ **Qualitative** ☐ **Quantitative** ☐ **Other (specify below and attaché supporting docs)**

G. Initial Probability of Occurrence: *(State the initial probability and basis that the risk will occur – without credit for risk response)*

Qualitative Descriptor (see Appendix B for criteria): ☐ Very Unlikely (VU) ☐ Likely (L) ☐ Unlikely (U) ☐ Very Likely (VL)

Numerical Factor (see Appendix B for criteria): P = (decimal value between 0 and 1)

H. Initial Consequence of Occurrence: *(State the consequences and quantity basis if the risk occurs – without credit for risk response)*

Qualitative Descriptor (see Appendix C for criteria): ☐ Negligible (N) ☐ Significant (S) ☐ Crisis (Cr) ☐ Low/Minor (M) ☐ Critical (C)

Numerical Factor (see Appendix C for criteria): C = (decimal value between 0 and 1)

Worst Case Cost Impact (optional): Worst Case Schedule Impact (optional):

I. Initial Risk Factor: *(Probability × Consequence = Risk Factor)*

J. Initial Risk Level (see instructions for criteria): ☐ **Low (L)** ☐ **Moderate (M)** ☐ **High (H)**

K. Risk Quantification Notes (optional):

Response Plan: (how risk is to be addressed; include action plans and definition of success)
RISK HANDLING, RESPONSE, AND IMPACT DETERMINATION SECTION
L. Risk-handling Strategy and Response Actions:

Risk-handling Strategy: ☐ Avoid ☐ Reduce ☐ Mitigate ☐ Accept ☐ Other (specify below)

Risk Response Plan Summary (Description and Bases - optional)

Description of Specific Response Actions: Action Tracking System No.

Response Plan Implementation Cost (basis): Total $ (additional to baseline):

M. Residual Probability of Occurrence: *(State the initial probability and basis that the risk will occur -- after risk response)*

Qualitative Descriptor (see Appendix B for criteria): ☐ Very Unlikely (VU) ☐ Likely (L) ☐ Unlikely (U) ☐ Very Likely (VL)

Numerical Factor (see Appendix B for criteria): P = (decimal value between 0 and 1)

N. Residual Consequence of Occurrence: *(State the consequences and quantity basis if the risk occurs – after risk response)*

Qualitative Descriptor (see Appendix C for criteria): ☐ Negligible (N) ☐ Significant (S) ☐ Crisis (Cr) ☐ Low/Minor (M) ☐ Critical (C)

Numerical Factor (see Appendix C for criteria): C = (decimal value between 0 and 1)

Cost Impacts (best case, most likely, worst case - optional):

Schedule Impacts (best case, most likely, worst case - optional)

O. Residual Risk Factor: *(Probability × Consequence = Risk Factor)*

P. Residual Risk Level (see instructions for criteria): ☐ **Low (L)** ☐ **Moderate (M)** ☐ **High (H)**

Q Description of Residual Risk (optional):

R. Schedule to Cost Conversion Factor (optional): $ per unit

S. Additional Comments (optional):

APPROVAL

Project Manager Print/Type Name	Project Manager Signature	Date

Distribution: Program Sponsor(s) [Customer(s)], Project Team, and Project Manager's Home Organization Supervisor.

NOTE: These instructions apply to INEEL Form 410.06 as augmented by the OU 7-10 Stage III Project. The form has been augmented to reflect DOE Project Management Practice 8 and to facilitate documentation of identified risk items, performance of risk analysis and quantification, planning of risk-response actions, and determination of risk impacts.

Line A	Provide a clear statement of the risk to be assessed. Refer to the RMP, Section 3.3.3, for additional guidance on writing risk statements.
Line B	Provide a description of the risk including details on the causal event and associated impacts to the project. This description should include enough information to clearly show why the risk is above-normal.
Line C	Optional—Identify the assessable element associated with the source of the risk item. Refer to the RMP, Section 2.3.2, for the assessable element structure.
Line D	Optional—Identify the Work Breakdown Structure element number associated with the source of the risk item.
Line E	Optional—Identify risk type for tracking and reporting purposes. Use P, T, C, or S for programmatic, technical, cost, and schedule risk types, respectively. For cases where more than one risk type applies, use the type that applies most to the specific risk item.
Line F	Identify the risk assessment method to be used for quantifying the risk associated with the item. Be consistent throughout the assessment. When an alterative method is selected, specify the method to be used and attach any documentation necessary to explain the basis for the assessment (e.g., probability value, consequence value, and resulting risk factor/level). Alternative methods include, but are not limited to, expected monetary value, expert judgment, simulation, and decision trees.
Line G	Identify the initial (i.e., before risk response) probability of occurrence of the risk in qualitative and numerical terms. Include the basis for arriving at these probability values. Refer to the criteria provided in the RMP, Appendix C, when assigning the risk probability of occurrence. Ensure that the qualitative descriptor matches the numerical factor assigned.
Line H	Identify the initial (i.e., before risk response) consequence of occurrence of the risk in qualitative and numerical terms. Include the basis for arriving at these consequence values. The worst-case cost and the schedule impact if the consequence is realized also may be identified (optional). Refer to the criteria provided in the RMP, Appendix D, when assigning the consequence of occurrence. Ensure that the qualitative descriptor matches the numerical factor assigned.
Line I	Calculate the initial risk factor by multiplying the probability-of-occurrence numerical factor and the consequence-of-occurrence numerical factor.
Line J	Determine initial risk level based on criteria provided in Table 4, "Risk item log data elements," in the RMP.
Line K	Optional—Provide additional comments that apply to quantification of the risk item or further explanation associated with Lines F through I.
Line L	Identify the preferred risk-handling strategy and document the risk-response plan by describing the specific response actions. An optional summary of the approach also may be provided for further clarification. When assigned, record the project action item tracking system number for each action item in the response plan as a cross reference. Additional rows may be added to accommodate a greater number of actions. Word the actions to be singular in nature and have one assignee (or point of contact). Identify any applicable due dates and indicate what must be provided for closure of the action item. Document the impact (if significant) to the project cost baseline caused by implementing the risk-response plan including the dollar amount and basis.

Line M	Identify the residual (i.e., after risk response) probability of occurrence of the risk in qualitative and numerical terms. Include the basis for arriving at these probability values. Refer to the criteria provided in the RMP, Appendix C, when assigning the risk probability of occurrence. Ensure that the qualitative descriptor matches the numerical factor assigned.
Line N	Identify the residual (i.e., after risk response) consequence of occurrence of the risk in qualitative and numerical terms. Include the basis for arriving at these consequence values. The (best case, most likely, and worst case) cost and schedule impacts if the consequence is realized also may be identified (optional) for the purpose of calculating (by Monte Carlo analysis) the T&PRA contingencies if deemed necessary by the project manager. Refer to the criteria provided in the RMP, Appendix D, when assigning the consequence of occurrence. Ensure that the qualitative descriptor matches the numerical factor assigned.
Line O	Calculate the residual risk factor by multiplying the residual probability-of-occurrence numerical factor and the residual consequence-of-occurrence numerical factor.
Line P	Determine residual risk level based on criteria provided in Table 4, "Risk item log data elements," in the RMP.
Line Q	Optional—Provide description of the residual risk in terms of anticipated work or rework.
Line R	Optional—Identify cost-per-unit time of delay (i.e., hotel load cost).
Line S	Provide additional comments that may apply to the risk and its response plan.

RMP = Risk Management Plan.

T&PRA = technical and programmatic risk analysis.

Appendix C

Risk Probability-of-Occurrence Criteria

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Appendix C

Risk Probability-of-Occurrence Criteria

Qualitative probability-of-occurrence criteria listed in Table C-1 are based on the life cycle of the OU 7-10 Stage III Project. The project life cycle is defined as the duration of the design, construction, operation, operations closeout, and deactivation, decontamination, and decommissioning of the facility.

Table C-1. Qualitative risk probability-of-occurrence criteria for the OU 7-10 Stage III Project.

Qualitative Probability of Occurrence		
Descriptor	Numerical Factor	Criteria
Very unlikely	≤0.1[a]	Is very unlikely to occur in the life cycle of the project; or estimated occurrence interval greater than 1,000 years.
Unlikely	0.2, 0.3, 0.4	Not expected during the life cycle of the project; or estimated occurrence interval is between 1,000 and 100 years.
Likely	0.5, 0.6, 0.7	Will likely occur during the life cycle of the project; or estimated occurrence interval is between 100 and 10 years.
Very likely	0.8, ≥0.9[b]	Expected to occur several times during the life cycle of the project; or estimated occurrence interval is less than 10 years.

a. Use discrete values of 0.01, 0.05, or 0.10 only for calculating risk factors.

b. Use discrete values of 0.9, 0.95, or 0.99 only for calculating risk factors.

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Appendix D

Risk Consequence-of-Occurrence Criteria

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Appendix D

Risk Consequence-of-Occurrence Criteria

Qualitative risk consequence-of-occurrence criteria for the OU 7-10 Stage III Project are listed in Table D-1. Note that each potential consequence is independent of all others. The consequence of occurrence value (i.e., qualitative descriptor and numerical factor) for a risk item is the highest severity level noted during the assessment for its potential impacts (e.g., cost, schedule, worker exposure or injury, and degree of environmental remediation required).

Table D-1. Qualitative risk consequence of occurrence criteria for the Operable Unit 7-10 Stage III Project.

Qualitative Descriptor and Numerical Factor	Consequence of Occurrence Severity Criteria[a]
Negligible (≤0.1)[b]	Minimal or no consequence (i.e., unimportant). Use of management reserve but budget estimates not exceeded. Minor, recoverable slip in project schedule (<1 month). Total worker exposure up to 5 mrem.[c]
Low or minor (0.2, 0.3, or 0.4)	Minor redesign, construction alterations, or repair. Possible change in functions but not in facility mission or environment. Minor space allocation or association changes. Minor environmental remediation or protection. Minor medical intervention (e.g., first aid or recordable injury). Cost estimates that marginally exceed budget (requires use of contingency). Minor, recoverable slip in project schedule (1 to 2 months). Total worker exposure between 5 and 750 mrem.[c]
Significant (0.5, 0.6, or 0.7)	Insignificant redesign or construction alterations and repair. Some change to facility mission or environment. Significant space allocation or associated changes. Significant environmental remediation or protection. Injury requiring medical treatment (e.g., recordable injury resulting in lost or restricted workdays). Cost estimates that significantly exceed budget. Minor, recoverable slip in project schedule (2 to 6 months). Total worker exposure between 750 mrem and 1 rem.[c]

Table D-1. (continued).

Qualitative Descriptor and Numerical Factor	Consequence of Occurrence Severity Criteria[a]
	Exposure to hazardous substance (e.g., chemical, noise, no ionizing radiation, physical, or biological agents) in excess of established limits (e.g., Occupational Safety and Health Association permissible exposure limits or American Conference of Governmental Industrial Hygienists threshold limit values).
Critical (0.8 or 0.9)	Impact-required design and construction cannot be completed as planned. Significant change to facility mission or environment. Only part of mission completed requiring major facility redesign or rebuilding. Space allocation and association to be replanned for the project. Extensive environmental remediation or protection. Intensive medical care for life-threatening injury resulting in hospitalization for more than 5 continuous days. Cost estimates that seriously exceed budget involving Congress and the U.S. Department of Energy Headquarters. Excessive schedule slip (6 to 12 months) that seriously affects overall mission. Total worker exposure between 1 and 5 rem.[c] Exposure to a condition that is immediately dangerous to life or health without both appropriate personal protective equipment and procedures in place.
Crisis (>0.9)[d]	Project cannot be completed. Cost estimates that unacceptably exceed budget (increase in total estimated cost or total project cost). Catastrophic threat to facility mission environment. Possible loss of mission, long-term environment damage, or worker fatality. Excessive project schedule slip (more than 12 months) seriously affecting overall mission. Total worker exposure that exceeds 5 rem.[c]

a. The items shown include potential consequences if a risk condition or event occurs that may impact a life-cycle phase of the project. Each impact is considered independent of the others. Consequence of occurrence is the highest level noted for the risk.
b. Use discrete values of 0.01, 0.05, or 0.1 only for calculating risk factors.
c. Total worker exposure is the sum total for the project for the event.
d. Use discrete values of 0.95 or 0.99 only for calculating risk factors.

Appendix E

Risk-Handling Strategies—Typical Project Application and Summary Information

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Appendix E

Risk-Handling Strategies—Typical Project Application and Summary Information

Appendix E identifies guidance for typical application of risk-handling strategies used on the Operable Unit (OU) 7-10 Stage III Project. This appendix also provides a summary of the strategies and identifies several example risk responses for each strategy. The purpose of this appendix is to aid risk owners in making appropriate risk-handling strategy selection by stimulating ideas for responding to individual risk events. Table E-1 shows the typical application of risk-handling strategies for controlling project risks. See Section 3.5.1 of the *OU 7-10 Stage III Risk Management Plan* for descriptions of these handling strategies. Table E-2 shows summary information and examples for risk-handling strategies.

Table E-1. Typical application of risk-handling strategies for controlling project risks.

	Risk-Handling Strategies					
Risk Level	Reduction	Mitigation	Acceptance	Avoidance	Transfer[a]	Spreading[b]
High	✓	✓		✓	✓	✓
Moderate	✓	✓		✓	✓	✓
Low	✓	✓	✓	✓		✓

Key:

✓ = usual or preferred strategy.

✓ = potential strategy.

a. Traditional definition (e.g., purchase insurance).

b. Includes transfer risk-handling strategy as defined in DOE Practice 8.

Table E-2. Summary information and examples for risk-handling strategies.

	Strategy	Description	Residual Risk Status	Implementation Cost/Schedule Impact?	Cost	Schedule	Technical	Resources
Primary	Reduction	Involves taking action(s) intended to lower the probability that a risk event will occur.	Some residual risk remains.	Yes	Design-to-cost Competitive procurement Earned value analysis/tracking Investment analysis (MARR and ROI) Make/buy and cost/benefit analyses Incremental development Benchmarking	Monitor/trend schedule variances Resource loading analysis (histograms) Make/buy Long-lead procurement identification Incremental development Detailed scheduling PERT/CPM Task analysis Benchmarking	• Technology development planning • Technology testing (bench, pilot, prototype, and system operability) • Competitive design • Formal design review • Statistical process control • Total quality management • Benchmarking • Upstream controls • Physical/analytical modeling • Design for reliability (e.g., redundancy) • System engineering – Alternatives analysis (trade studies) – Decision analysis – Technical performance measurement	• Sole source justification • Staff augmentation • Job matching • Cross training • Prescheduling key resources • Early acquisition and staffing • Reference checking • Qualified supplier list • Preaward audits • Resource availability analyses – Loading histograms – Critical resource identification – Detailed planning

Table E-2. (continued).

	Strategy	Description	Residual Risk Status	Implementation Cost/Schedule Impact?	Cost	Schedule	Technical	Resources
Primary	Mitigation	Involves taking action(s) intended to reduce the impact or consequence of a risk event.	Some residual risk remains.	Yes	• Cost Reduction/cost control • Continuous Improvement • Build in contingency cost – T&PRA (using Monte Carlo analysis) • Use contingency cost	• Build in schedule float – T&PRA Monte Carlo • Use schedule float • Institute work arounds (contingency planning) • Fast tracking (parallel processing)	• Install backup standby system and components • Barriers/engineering controls • Recovery plans and procedures • Component redesign • Prepositioned resources • Use backup system/ components • Parallel technology development	• Reserve/procure more resources (extra before event or in response to event) • Overtime • Productivity improvement • Modify work schedule
	Acceptance	Involves making a conscious determination that the level of risk (or residual risk) can be tolerated or allowed.	No change to risk exposure – residual risk equals original risk.	None	• Informed do nothing	• Informed do nothing	• Informed do nothing	• Informed do nothing
	Avoidance	Involves taking action(s) intended to eliminate the source of the risk by modifying circumstances or conditions such that the probability of the event is zero or that there are no impacts or consequences.	No residual risk.	Yes	• Value engineering • System engineering – Alternatives analysis (trade studies) – Requirements scrubbing	• Renegotiate milestones/ deliverable dates • Long-lead procurement tradeoffs • Task analysis • System engineering – Requirements scrubbing	• Isolate target • Value engineering • System engineering – Alternatives analysis (trade studies, total component redesign) – Requirements scrubbing	• Reference checking • Qualified supplier list • Resource scheduling • System engineering – Alternatives analysis (trade studies)

Table E-2. (continued).

	Strategy	Description	Residual Risk Status	Implementation Cost/Schedule Impact?	Cost	Schedule	Technical	Resources
Alternate	Transfer (traditional)	Involves shifting the risk to a third party (typically, after a monetary conversion) (e.g., insurance policy).	No residual risk.	Implementation cost impact, but typically no schedule impact.	• Insurance policies	• Performance bonds	• Performance bonds • Outsourcing (make or buy)	• Creative subcontracting • Specialized insurance policies
	Spreading	A deliberate distribution of the risk (either probability or consequence) by the allocation of margins across system interfaces.	Potential for residual risk, case by case.	Potential for implementation cost and/or schedule impact, case by case.	• Multiple (but reduced) funding sources • Cost overrun and underrun sharing	• Parallel or concurrent processing	• Physical separation • As low as reasonably achievable • N-squared (interface) analysis • Quality function deployment	• Subcontract to third party with greater skill or expertise • Subcontract to third party with advanced or proprietary capability

CPM = critical path method.
MARR = marginal analysis of rate of return.
PERT = project evaluation and review technique.
ROI = return on investment.
T&PRA = technical and programmatic risk analysis.